Nig. J. Anim. Prod. 2021, 48(3): 173 - 180. doi.org/10.51791/njap.v48i3.2952 *Nigerian Journal of Animal Production*

Performance of Red Sokoto goat fed graded level of *Ziziphus mauritiana* (Magarya) leaves as milk enhancer

*[1]Yahaya, Y. A, [2]Sadiq, M. S. and [3]Muhammad, I. R.

[1.]*Department of Animal husbandry Services, Federal Ministry of Agriculture and Rural Development, Area 11Garki Abuja.*

[2.]*Department of Animal Science, Faculty of Agriculture, Federal University, Kashere*

[3.]*Centre for Dryland Agriculture, Bayero University, Kano*

***Corresponding author:** yakububgr@yahoo.com; +2348030554258

Abstract

The study conducted to investigate the performance of Red Sokoto goat fed graded level of Ziziphus mauritiana (Magarya) leaves as milk enhancer. Ziziphus mauritiana is widely distributed and evergreen plant of the study area; perhaps it could play an important role as fodder. A Feeding trail for 12 weeks was carried out to determined weight gain, milk yield by Red sokoto goats fed graded level of Ziziphus mauritiana. Twenty Red Sokoto goats were randomly allotted to five treatments as A (Negative control), B (0%,C (10%), D (20%) and E C (30%) of four replicates. The four experimental diets formulated were designate as B (0%,C (10%), D (20%) and E C (30%) inclusion levels of the test ingredient, Parameters measured were does and kids weight changes, milk yield, total solid, protein, fat, solid not fat, pH and ash. The result showed that the ash content of the experimental diets varied significantly (P< 0.05) across the treatments, with 0% inclusion level having the highest ash content (12.29%) followed by 10% inclusion level (11.83%) while 30% inclusion level had the least (09.22%). The crude protein (CP) content was higher in 30% inclusion level (16.11%) , while EE and CF were however higher in 30% inclusion level 6.33% and 30.75%) respectively. Milk yield was estimated by the weigh-suckle-weigh method. The result revealed that milk yield, total solid, SNF, fat and ash varied significantly (P<0.05) among the treatments. Treatment D was superior to other treatments in the average milk yield (0.43Kg/day), fat (4.41%) and protein (3.54 %) content. Furthermore, Weight Changes of Kids showed treatment D at nine week had the higher weight gain followed by treatments E. It is therefore, concluded that supplementation of lactating Does with treatment D (20% level as supplement) throughout trial, positively improves lactation performance of the does and kids weight changes. Therefore, it is however, suggested that further investigation on the anti-nutritional factors of the plant.

Keywords: *Ziziphus muaritiana,* Red Sokoto, milk yield, growth performance

Performance de la chèvre Rouge Sokoto nourrie de feuilles de Ziziphus mauritiana (Magarya) comme exhausteur de lait

Résumé

L'étude menée pour étudier la performance de la chèvre Rouge Sokoto nourrie des feuilles de Ziziphus mauritiana (Magarya) feuilles comme exhausteur de lait. Ziziphus mauritiana est largement répandu et plante à feuilles persistantes de la zone d'étude; peut-être qu'il pourrait jouer un rôle important en tant que fourrage. Une piste d'alimentation pendant 12 semaines a été effectuée pour déterminer le gain de poids, le rendement laitier par les chèvres sokoto rouges nourries niveau classé de Ziziphus mauritiana. Vingt chèvres Sokoto rouges ont été attribuées au hasard à cinq traitements comme A (contrôle négatif), B (0%, C (10%), D

(20%) et E C (30 %) de quatre répliques. Les quatre régimes expérimentaux formulés ont été désignés comme B (0%, C (10%), D (20%) et E C (30%) niveaux d'inclusion de l'ingrédient d'essai, Paramètres mesurés ont été fait et les enfants changements de poids, le rendement du lait, total solide, protéines, gras, solide pas gras, pH et cendres. Le résultat a montré que la teneur en cendres des régimes expérimentaux variait considérablement (P< 0,05) entre les traitements, le taux d'inclusion de 0 % ayant la teneur en cendres la plus élevée (12,29 %) suivi d'un taux d'inclusion de 10 % (11,83 %) tandis que le niveau d'inclusion de 30 % était le moins élevé (09,22 %). La teneur en protéines brutes (CP) était plus élevée dans le niveau d'inclusion de 30 % (16,11 %), tandis que l'EE et les FC étaient toutefois plus élevés dans le niveau d'inclusion de 30 % 6,33 % et 30,75 %) respectivement. Le rendement du lait a été estimé par la méthode de pesée-lait-pesée. Le résultat a révélé que le rendement laitier, le solide total, le SNF, la graisse et les cendres variaient considérablement (P<0,05) parmi les traitements. Le traitement D était supérieur à d'autres traitements dans le rendement laitier moyen (0,43 kg/jour), la graisse (4,41 %) protéines (3,54 %) Contenu. En outre, les changements de poids des enfants ont montré le traitement D à neuf semaines a eu le gain de poids plus élevé suivi des traitements E. Il est donc conclu que la supplémentation de la lactation ne avec le traitement D (20% niveau comme supplément) tout au long de l'essai, améliore positivement la performance de lactation des changements de poids ne et les enfants. Par conséquent, il est toutefois suggéré que des enquêtes plus approfondies sur les facteurs antinutrit nutritionnels de la plante.

Mots-clés: Ziziphus muaritiana, Red Sokoto, rendement laitier, performance de croissance

Introduction

Ruminants in most parts of the tropics are grazed extensively on native forages which are poor in quality (Ikhimioya *et al*, 2005). The short fall of forage quality and quantity contributes for the reduced livestock productivity (Mengistu, 2003) which is more severe during the dry season. Alternative are browses. *Ziziphus muaritiana* could be one of such browses, which supply goats and camels with the bulk of their nutritive requirements and complement the diet of cattle and sheep with protein, vitamins and minerals in which bush straw is deficient during the dry season (Paterson *et al.*, 1998, Guttridge and Shelton, 2001). The red Sokoto goats are the dominant and most widely distributed in the Northern Savannah belts of Nigeria Gall (1996). Red Sokoto goat had the highest population followed by the West African Dwarf and Sahel with least population (Zahraddeen, 2006). The Red Sokoto goat is found throughout the subhumid and semi -arid zones of Nigeria (Zahraddeen *et al.,* 2009). They are the most important goat breed in Nigeria, accounting for about 70% of the estimated 34.5 million goats in Nigeria (Osuhor *et al*., 1998). Therefore, this study was design to evaluate the effect graded level of *Ziziphus mauritiana* (Magarya) as fodder for milk enhancement in Red Sokoto Goat.

Material and methods

Study area

The experiment was carried out at the Livestock Teaching and Research Farm, Bayero University, Kano, Kano lies on longitude 9° 30' and 12° 30' North and latitude 9° 30' and 8° 41' East. It is characterized by tropical wet and dry climate (Olofin, 1987). Annual rainfall and temperature ranges between 787 to 960 mm and 21^{0}C to 39 ^{0}C respectively (KNARDA, 2001).

Experimental animals, management and design

Twenty Red Sokoto goats were purchased from village market in Kano State. They were quarantine for two weeks in the

livestock Teaching and Research Farm, Prior to commencement of the experiments, the experimental animals were also dewormed with Albendazole at 1mL/ 50kg body weight and sprayed against ecto-parasite with Pour on at 5ml/animal, Oxytetracycline L.A. (a broad spectrum antibiotic) administered by injection. The animals were kept in a pen with enough ventilation measuring 2m . 1m. The treatments diets were varying levels of dried leaf of *Ziziphus muaritiana* (Magarya). Treatment designated (A) was a negative control in which the animals were grazed on the native range without any form of supplementation. Four experimental diets were formulated and designated as treatments B, C, D and E representing 0%, 10%, 20% and 30% inclusion levels *of Ziziphus muaritina* Table (1). The feed ingredients used were *Ziziphus muaritina,* wheat offal, Cotton seed cake and 1% salt were purchased from Yan Dusa market in Kano state. A complete randomized design (CRD) was used in the experiment, the experimental animals were allocated to the five treatment groups comprising four animals per treatmentand. and fed with the experimental diets at the rate of 4% of their body weights.

Data collection

Live weight changes

Prior to the commencement of the experiment, the experimental animals were balanced for weight and allocated into five treatment groups. The initial weights were taken and the animals were thereafter weighed weekly in order to find out their live weight changes, Live weight changes of both the dams and the kids were monitored. The live weight changes were determined by difference (final-initial).

Milk yield

Milk yield was estimated by the weigh-suckle-weigh method as described by (Djibrillou *et al*., 1998). The kids were weighed before and after suckling, and the difference between the two weights gave the milk yield of the dam. The recorded milk was multiplied by 2 as described (Bencini *et al*., 2003) since it was a collection over a period of 12 hours to obtain the daily milk yield.

Milk samples collection and analysis

Milking is done by grasping the teat with all fingers and pressing against the palm for samples collection weekly and were quickly transported to the laboratory, and stored in a refrigerator at –5^{o}C untill required for analysis. The four weeks collected milk were thawed at 40^{o}C to melt the fat and then cooled to 20^{o}C and thoroughly mixed and evaluated for gross composition (acidity, total solids, fat, crude protein, pH and ash). Milk protein (MP) was determined using formol titration of nitrogen (N %) and % N×6.25 to obtain crude protein (CP). Total solids (TS) were determined by first evaporating 4g of milk sample over a boiling water bath (100^{o}C) for 30 minutes and then oven dried to constant weight. Fat was determined by Gerber method. Total solid was determined by Gravimetric method. Solid-not-fat was calculated by the difference between by total solid and fat content. Total ash was estimated by heating 10g at a temperature of 500^{o}C. Milk pH was determined by using pH meter.

Data analysis

Data generated were subjected to analysis of variance (ANOVA) using general linear model of SAS (1999-2000). Difference between means were compared at ($P<0.05$) using least significance difference (LSD) of the same statistical package.

Results and discussion

Proximate composition of experiment diet

Table 1 presents the proximate composition of the experimental diets. The result showed that the ash content of the experimental diets varied significantly ($P< 0.05$) across the treatments, with 0% inclusion level

having the highest ash content (12.29%) followed by 10% inclusion level (11.83%) while 30% inclusion level had the least (09.22%). There were however, non-significant (P< 0.05) differences in other proximate constituents. The CP content is higher in 30% inclusion level (16.11%), while EE and CF but were r higher in 30% inclusion level 6.33% and 30.75%, respectively.

Table 1: Chemical constituents (% in DM) and energy (Kcal/g DM) of experimental supplement

TRT (%)	ASH	DM	MC	CP	CF	EE	ENERGY
A							
B (0)	12.29	88.24	11.77	13.95	25.11	4.27	199.71
C (10)	11.83	89.71	10.29	13.14	25.69	4.35	200.35
D (20)	10.89	88.12	11.84	16.11	27.48	5.84	317.98
E (30)	09.22	88.23	11.78	15.28	30.75	6.33	373.19
ZM	9.59	94.9	5.1	15.77	18.56	3.16	290.09

Milk yield and composition

Table 2 presents the milk yield and its composition from animals supplemented with or without *Ziziphus* leaf. Among the variable evaluated milk yield, total solid, SNF, Fat and Ash manifested significant (P<0.05) variation due to the treatments imposed, Milk yield vary from 0.38 Kg/day to 0.43Kg/doe/day. Treatment C and D were comparable and produced higher milk yield compare to the other treatments evaluated. Milk acidity range from 0.18 to 0.22, there was no statistical difference (P>0.05) in milk acidity. Similarly, pH did not show Statistical significance (P> 0.05), the values obtained varied from 5.65 to 5.70%. Milk protein content evaluated in the present study did not manifest statistical significance (P>0.05), the values obtained varied from 3.13 to 3.48%. Total solid from the milk examined had significant variation (P<0.05) in treatment A and E, while variation between other treatments were comparable (P>0.05). Solid not fat in the milk evaluated reveal that treatment E had higher content (17.57%) while treatment A had the least (13.73%) differences among other treatments are comparable (P<0.05). Fat content from the milk examined present significant variation (P<0.05) between treatments (A and B) and (C, D and E). The variations between treatment C and treatment D were comparable (P>0.05) also, Ash content evaluated in the present study revealed that treatment E and treatment D are comparable (P>0.05) and had higher (0.81 and 0.69%) ash content, the variation between other treatments is statistically significant (P<0.05). Milk yield showed decreasing trend from early to late phase of lactation irrespective of the treatments evaluated. The pattern in the present trial was in agreement with the report by (Gall 1996) who reported peak milk yield in goats was at 2-5 weeks post-parturm in 12 – 15 weeks lactation. Eknaes *et al*. (2006), in their separate studies showed that genetic make-up and nutritive intake of different breeds of goats greatly influenced the milk yield and its composition. Morand-Fehr *et al.* (1982) stated that within genetic limits, nutrition during lactation is the primary factor that influences milk yield. The average milk yield recorded in this study was 0. 41 Kg day^{-1} is in agreement to the reports by Malau-Aduli *et al*. (2003) and Akpa *et al*. (2002) of between 0.3 to 1 Kg day^{-1} with the same breeds of goats but is higher than (0.18 Kg) what was reported by Tendonkeng-Pamo *et al*. (2006) where West Africa dwarf does were fed multipurpose leguminous tree leaves. This increases in milk yield noted could be attributed to the feeding of

Ziziphus Muaritiana fodder.The protein content of the milk analysed for composition ranges from 3.13 to 3.54 % were similar with the report of Garba (2010). Also, mean value of milk fat of (3.95 to 4.41 %) in the present study was similar to those earlier reported by Garba (2010), Prasad and Sengar (2002) and Greyling *et al*. (2004) conversely, it was higher than 3.7% reported by Makun *et. al*., (2008) and the value 4.94 (Zarhraddeen *et al*., 2007). Total solid 17.53 % to 21.68 % and Solid not fat 13.73% to 17.57% is within the range reported by Midau (2010) and higher than reported values of Alawa and Oji (2008) and Garba (2010) while milk pH and ash are within the range reported by Zahrradeen *et al*. (2007). Evidently, improvement in milk component was observed which is attributed to feeding of *Ziziphus muaritiana* leaf.

Table 2: Mean and LSD of milk yield and composition (%) in goats as influenced by feeding graded levels of *Ziziphus mauritiana* in their supplement diet

TRT	MY/Kg	Acidity	Ph	Protein	Total Solid	SNF	Fat	Ash
A	0.38^{c}	0.20	5.66	3.13	17.53^{b}	13.73^{b}	3.95^{b}	0.59^{b}
B	0.39^{bc}	0.20	5.70	3.26	18.18^{ab}	14.27^{b}	3.98^{b}	0.60^{b}
C	0.43^{a}	0.18	5.65	3.36	19.28^{ab}	15.20^{b}	4.38^{a}	0.57^{b}
D	0.43^{a}	0.19	5.68	3.54	20.2^{ab}	16.11^{ba}	4.41^{a}	0.69^{ab}
E	0.42^{ab}	0.22	5.65	3.48	21.68^{a}	17.57^{a}	4.38^{a}	0.81^{a}
LSD	0.03	0.03	0.18	0.46	2.23	2.17	0.33	0.16

Mean in the same column having different superscript(s) are significantly different $P<0.05$

Figure 1 presents the average birth weight of male and female kids obtained was 1.52 Kg and 1.35 Kg respectively. This was similar to the DAGRIS (2007) who reported 1.50Kg and 1.35Kg for male and female and Garba (2008) who resported 1.60 Kg and 1.40 Kg for male and female respectively for the same breed and location of the study. The average daily weight gain of kids in the study was similar to Njidda (2010) who reported weight gain of 0.03 to 0.07 Kg day^{-1} using some Semi-arid browse forages leaves but higher than the reported 0.046 Kg day^{-1} by Makun (2008) using browse leaves and concentrate using the same breed of animals. However, responses noted from the kids could be attributed for the feeding of dam with *Ziziphus muaritiana* fodder. Figure 2 present gives summary of the performance characteristics of Red Sokoto goat fed graded levels of *Ziziphus mauritiana* leaves. The liveweight changes (Kg) of kids by treatments of the Does fed graded levels of *Ziziphus mauritiana* in their supplement diet. The result showed that kids in treatment D at nine week (4.35 Kg) had the higher weight gain followed by treatments E (4.18 Kg), B (3.93) and treatment C (4.06Kg) while treatment A. (3.49Kg) had the least, all the treatments had an average daily gain ranging from 0.039 Kg to 0.045Kg. There was a general loss in the body weight of the lactating does across treatments following parturition and lactation. At sixth week of lactation does across all the treatments begin to gain weight with the exception of treatment one (A) which gain at ninth week of lactation this may perhaps due to no supplements was given to them. According to Morand-Fehr (2005) weight loss in does is normally related to the mobilization of body reserves (protein and fat) and labile protein stored during the dry period to maintain milk production throughout lactation. The decrease in body weight after kidding and during the early lactation as a result of mobilization of body reserves was also reported by Eknæs *et al*. (2006). The rate of

weight loss was however statistically (P>0.05) similar among treatments. This agreed with the study by Makun (2008) who reported general loss in the body weight following parturition. However, the weight gain recorded at week six is in harmony with Greyling *et al*. (2004) who reported does were able to improve on their weight loss towards the end of the 12 week of lactation.

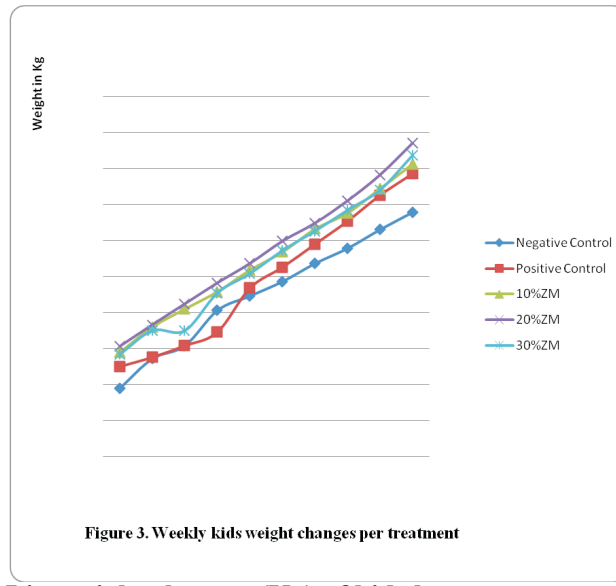

Figure 1. Liveweight changes (Kg) of kids by treatments

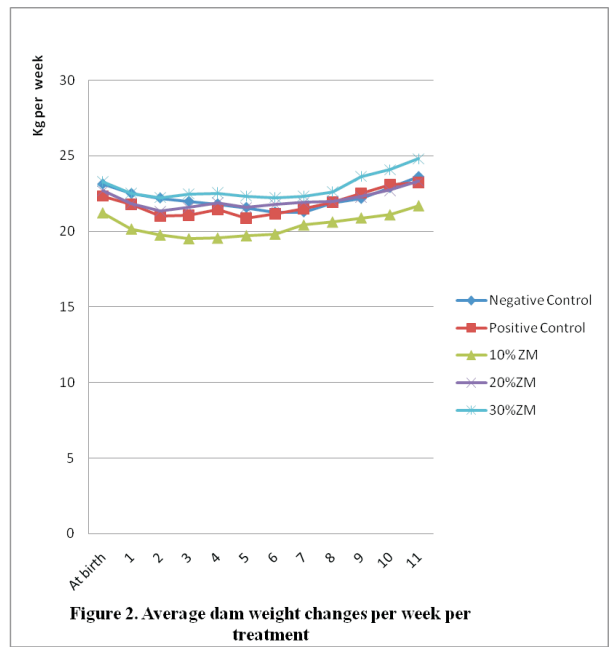

Figure 2. Liveweight changes (Kg) of kids by treatments

Conclusion

It is concluded that animals fed 20% inclusion levels of ***Ziziphus muaritiana*** leaves compared favourably with animals placed on Negative control and 0% inclusion level (control diet). Therefore, it is concluded that, ***Ziziphus muaritiana*** has the potential of meeting the nutritional needs of lactating goat in terms of milk production and weight gain ***Ziziphus muaritiana*** can therefore be used as a suitable feed stuff for Red sokoto during lactating for improving the performance and productivity of ruminant livestock

Acknowledgement

The authors are grateful to the Department of Animal Science, Bayero University, Kano for allowing them the use of the experimental animals in the conduct of the research.

References

Akpa, G. N., Asiribo, O. E., Oni, O. O., Alawa, J. P., Dim, N. I., Osinowo, O. A. and Abubakar, B. Y. 2002. Milk production by agropastoralist Red Sokoto goats in Nigeria. Trop. Anim. Health Prod., 34: 525-533.

Bencini, R., Knight, T. W. and Hartmann, P. E. 2003. Secretion of milk and milk components in sheep. Aust. J. Exp. Agric., 43: 529-532. |

Gall, C. 1996. Red Sokoto goats In: Goat Breeds of the World. Bohler Verlag. Würzburg Germany, pp. 55-56.

Garba, Y. and Muhammad, I. R. 2008 Sabara (*Guiera senegalensis*) as browse and a potential milk enhancer in ruminants in the semi arid environment. Research Journal of Animal Sciences 2(4):123-127

Greyling, J. P., Mmbengwa, V. M., Schwalbach, L. M. J.and Muller, T. 2004. Comparative milk production potential of indigenous and Boer goats under two feeding systems in South Africa. Small Ruminant Res., 55: 97-105.

Grutteridge, R. C. and Shelton H. M. 2001. Forage tree legume as in Tropical Agriculture. CAB International Wallingford Oxon OX108DE. UK. Pp 6-7. Retrieved 20/7/2011

KNARDA, 2001. Kano Agricultural and Rural Development Authority Meteorological Station: Temperature Record Book and Management Unit 11: 1-3

Makun, H. J., Ajanusi, J. O., Ehoche, O. W., Lakpini, C. A. M. and Otaru, S. M. 2008. Growth rates and milk production potential of sahelian and red sokoto breeds of goats in Northern Guinea Savannah. Pak. J. Biol. Sci., 11: 601-606.

Malau-Aduli, B. S., Eduvie, L. O., Lakpini, C. A. M. and Malau-Aduli, A. E. 2003. Variations in live weight gains, milk yield and composition of Red Sokoto goats fed crop-residue-based supplements in the subhumid zone of Nigeria Livestock Prod. Sci., 83: 63-71.

Mengistu, U. 2004 Performance of the Ethiopian Somali Goat during different Watering Regimes

Morand – Fehr, P., Chilliard Y., Auvant, D. 1982. Goat milk and its components: Secretory mechanisms and influence of nutrition factors. Proc. of the Third. Inter. Conf. on Goat Prod. and Diseases. Jan. 10th – 15th , 1982. Coll. of Agric., the Uni. Of Arizona. Dairy Goat Journal Publishing Company. 11-112.

Morand-Fehr, P., 2005. Recent developments in goat nutrition and application. A review. Small Ruminant Res., 60, 25-43.

Njidda, A. A. and Ikhimioya, I. 2010 Evaluation of Some Semi-arid Browse Forages Leaves as Feed for

Goats. European Journal of Applied Sciences 2(3):108-115,2010. ISSN2079-2077.IDOSI Publication, 2010. Retrieved on 20/5/2011. www.idosi.org /ejas/2(3)10/3pdf

Paterson, R. T., Karanja, G. M., Roothaert, R. L., Nyaata, O. Z. and Kariuki, I. W. 1998. A review of tree fodder production and utilization within smallholder agroforestry systems in Kenya. Agroforestry Systems 41, 181-199.

Prasad, H. and. Sengar, O. P. S. 2002. Milk yield and composition of the Barbari goat breed and its crosses with jamunapari, beetal and black Bengal. Small Ruminant Res., 45: 79-83.

Tendonkeng-Pamo, E. T., Fonteh, F. A. Tendonkeng, F. Kana, J. R. Boukila, B. Djaga, P. and Fomewange, G. 2006. Influence of supplementary feeding with multipurpose leguminous tree leaves on kid growth and milk production in West African Dwarf goat. Small Rumin. Res., 63: 142-149.

Zahraddeen, D. Butswat, I, S, R, and Mbap S, T, 2009. A note on factors influencing milk yield of local goats under semi-intensive system in Sudan savannah ecological zone of Nigeria http://www.irrd.org/irrd21/3/cont.2103.htm

Zahraddeen, D., Butswat, I, S, R,, Mbap, S, T. 2007. Evaluation of some factors affecting milk composition of indigenous goats in Nigeria. LRRD, 19: 1-8.

Zahraddeen, D., Butswat, I. S. R., Sanusi, M. and Adamu, S. A. 2010. Characterization of Poultry Farming In Nigeria: A Case Study Of Taraba State Continental J. Animal and Veterinary Research 2: 1 - 8, 2010 http://www.wiloludjournal.com **retrieved on 23/02/2011**

Zahraddeen, D. 2006. Studies on reproductive performance and milk productivity of goats in Bauchi. Ph.D. Thesis, Abubakar Tafawa Balewa University, Bauchi, Nigeria, 210pp.

Djibrillou, O. A., Pandey, V. S., Gouro, S. A., Verhulst, A., 1998. Effect of urea-treated or untreated straw with cotton seed on performances of lactating Maradi (Red Sokoto) goats in Niger. Livest. Prod. Sci. 55, 117–125.

Eknaes, M., Kolstd, K. , Volden, H. and Hove, K. 2006. Changes in body researches and milk quality throughout lactation in dairy goats. Small Ruminant Res., 63: 1-11.

Ikhimioya, I. 2005. Chemical composition of some dry season shrub and tree foliages in Edo State Nigeria. Trop. J. Anim. Sci., 23: 62-163.

SAS institute Inc. 1999-2000. Statistical Analysis SAS/STAT. Guide for Personal Computers, Version 6th edition, Cary N. C. U.S.A Pp 967-798.

Received: 27th October, 2020
Accepted: 25th February, 2021