EFFECTS OF CONCENTRATE DIETS SUPPLEMENTATION ON SOME PREGNANCY VARIABLES AND WEIGHT OF KIDS OF KALAHARI RED DOES GRAZED ON *Chloris gayana*

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Abstract

A study was conducted for 22 weeks (153 days) to determine the effects of concentrate diets supplementation at three protein levels i.e. T_1: 12.42% (124.93gday^{-1}), T_2: 14.18% (145.87gday^{-1}) and T_3: 16.35% (168.19gday^{-1}) on some pregnancy variables and weight of kids kidded by pregnant Kalahari Red does grazed on paddock planted with Rhodes grass (Chloris gayana). A total of 33 matured Kalahari Red does of first parity within age range of 2 to 2$^1/_2$years with an average body weight of 38.10±1.13kg were randomly allotted to these 3 diets at 11 does per treatment. The diets were fed at 3% of the body weight on dry matter basis, and water was made available to the does ad libitum throughout the study. Data obtained were subjected to Analysis of Variance in a completely randomized design. It was observed that does fed T_3 had highest ($p<0.05$) values for products of pregnancy (10.35kg) taken within 24hours before kidding and foetal growth rate (88.37gday^{-1}) during pregnancy. Conversely, does fed T_2 had lowest values ($p<0.05$) of 9.28kg and 80.07gday^{-1} for each of the respective parameters. Afterbirth weight was also highest and lowest ($p>0.05$) for does supplemented with T_3 (3.38kg) and T_2 (3.04kg) respectively. On the other hand, T_2 supplemented does had highest value ($p<0.05$) for litter weight at birth which was 6.80kg, the value which was least for T_3 supplementation. Doe fed T_2 had the highest value for birth weight (3.20kg). From the results obtained from this study, it could be concluded that concentrate diet supplementation with 14.18% CP improved litter weight at birth with resultant reduction in weights of pregnancy variables of pregnant Kalahari Red does grazed on Rhodes grass.

Keywords: Kalahari Red goat, Pregnancy variables, Concentrate supplementation, Kid's weight

Introduction

Kalahari Red is regarded as an improved goat breed that originated from South Africa. The goat is an important meat-producing breed with characteristics such as adaptation to arid and semi-arid savannah, good foraging and excellent mothering abilities. It is regarded as a "minimum care/maximum profit" breed (Ramsay *et al.*, 2001). Concentrate supplementation to goats at various stages of growth had been reported (Mushi *et al.*, 2009; Kawas *et al.*, 2010) to enhance their performance. At mid-pregnancy in particular, nutrient requirements of foetus are still low, but placenta growth is essential. If growth of placental tissue is restricted by low plane of nutrition, it will be unable to adequately nourish the foetus in final stage of pregnancy and consequently birth weight will be compromised (Acero-Camelo *et al.*, 2008). Rapid foetal growth rate during the last 6-8 weeks (i.e. within 3rd trimester) of pregnancy imposes a metabolic challenge to the doe, which is met by the mobilisation of maternal body tissue (Osuagwuh and Aire, 1990). This may result in weight loss of the doe if the dietary supply of nutrients is inadequate (Hossain *et al.*, 2003; Rafiq *et al.*, 2003; Joshi *et al.*, 2004, Martin *et al.*, 2005). Kalahari Red goats which are known to be highly prolific in their native environment have recently been introduced into Nigeria for improvement of local breeds. It is therefore necessary to ascertain their reproductive performance in order to assess their response to various levels of crude protein in concentrate diets as supplement in Nigerian environment.

Materials and Methods

Animal Management and Experimental Procedure

A total of 33 matured Kalahari Red does of parity one within age range of 2-2$^1/_2$ years with an average body weight of 38.10±1.13kg were used. Flushing was done two weeks before the commencement of experiment. Experimental does were selected from flock of 68. Three

experienced and vigorous Kalahari Red bucks were used to detect does on heat. Does detected to be on heat were placed in a holding pen as experimental animals. The selected does were ear-tagged and randomly assigned to pen houses used for the study.

Mating was done by introduction of 3 Kalahari Red bucks into the pen houses (i.e. a buck/treatment). Proper observation was done to ensure that conception took place before data collection commenced. The does, after mating were fed experimental concentrate diets at three levels of protein. These were: T_1 (12.42% at 124.93gday^{-1}), T_2 (14.18% at 145.87gday^{-1}) and T_3 (16.35% at 168.19gday^{-1}) as supplements to forage (*Chloris gayana*) on the paddock. The diets were fed to the does at 3% of their body weight on dry matter basis. Each of the experimental diets was fed to 11 pregnant does. Experimental diets were fed by 08:00h and 16:30h each day i.e. half of the portion was fed in the morning and the remaining half in the evening. Grazing of the does was done by 10:00h after feeding and does were returned by 16:00h daily. Fresh and clean portable water was made available to the does daily *ad libitum*. Weights of does were recorded within 24hours before and after kidding. Weights of kids were also recorded within 24hours of birth after drying to determine afterbirth weight. Products of pregnancy and foetal growth rate were determined using: Products of Pregnancy= 13.4-(0.03035 x PGDG) and Foetal Growth Rate= 112-(0.235 x PGDG) as described by Akingbade *et al.* (2001) where PGDG was pregnant goat daily weight gain. Data obtained were subjected to ANOVA using completely randomised design at 5% probability. Significant means were separated using Duncan's Multiple Range Test.

Data Collection

The following reproductive data were collected:

i. Gestation Length of the Does: this was estimated by determining length of time (in days) between successful mating and kidding for each of the does;
ii. Litter Size/Prolificacy: this was obtained by counting number of kids born per doe;
iii. Birth Type: this was obtained by recording number of kids born by the does, where does that kidded 1 kid were assigned single, 2 kids as twins, and 3 kids as triplets;
iv. Litter Weight: this was obtained by taking weight(s) of all the new-born kid(s) per doe together after their bodies were dried off either by natural air or with the use of dry towel to absorb fluid on their bodies within 24 hours after kidding;
v. Birth Weight: this was obtained by taking weight of individual new-born kids after their bodies were dried off either by natural air or with the use of dry towel to absorb fluid on their bodies within 24 hours after kidding;
vi. Afterbirth Weight: This was weights of placenta, umbilical cord and foetal membranes such as allantois, chorion and amnion (together with amniotic fluid) that were expelled from uterus after kidding;
vii. Kid's Sex: Sex was recorded as either male or female kid.

Results and Discussion

Results obtained at the end of the study showed that does fed T_2 recorded lowest values for all the pregnancy variables (Table 1), whereas these values were highest for T_3 supplemented does. This was an indication that there was a nutrient balance for maternal body development and products of pregnancy by does fed T_2. T_3 supplemented does mobilised most nutrient for development of products of pregnancy at the expense of maternal body development. This was in agreement with the report of Osuagwuh and Aire (1990) that during pregnancy there is preferential nutrient utilisation for foetal growth at the cost of mobilisation of maternal body tissue which results in weight loss of doe. Products of pregnancy and foetal growth rate ranged from 9.28-10.35kg and 80.07-88.37gday^{-1} respectively. This result agreed with findings of Akingbade *et al.* (2001) who reported that does grazing on high protein pasture recorded higher values for products of pregnancy and foetal growth rate compared to does on natural pastures (with low protein) that had lower values for same parameters. This suggested that high protein diets, which is in excess of the needs of pregnant does were utilised by the body for improved products of pregnancy, thus increased foetal growth rate. Jainudeen and Hafez (2000) reported that the rate of foetal growth depends primarily on the feed supply and the ability of the foetus to use the feed among other notable factors such genetic, environmental, growth hormone and associated factors

Results on weight of kids produced by Kalahari

Red does grazing on Rhodes grass (*Chloris gayana*) supplemented with three concentrate diets is presented in Table 2. Supplementation of Kalahari Red does with T_2 produced kids with superior birth weight (3.2kg) and litter weight at birth (6.8kg). This could be attributed to improved live weight changes of the does during pregnancy due to their nitrogen utilisation, thus improved maternal body and foetal developments. This agreed with the report of Peart (1967) that dam's weight during pregnancy influenced kid weight at birth. Litter weight ranged from 4.72-6.80kg with mean value of 5.53kg for the dietary treatments. This implied that T_2 supplementation improved litter weight at birth better than other dietary treatments. The ranges of weights at birth, weights for male and female kids obtained were 3.16-3.20kg, 3.15-3.23kg and 2.88-3.40kg respectively. The birth weights were similar to that of Saanen kids as reported by Ince (2010). Contrary to the result of this study, some authors reported higher (Dayeh *et al.*, 1996; Ćinkulov *et al.*, 2009) and lower (Hassan *et al.*, 2007; Olomola *et al.*, 2008) values for German Fawn, Shami, West African Dwarf goats and Black Bengal goats. Variations in these birth weights may be due to mother's age and birth type (Ince, 2010). Weights of male kids for low and high protein diets were higher than weights of female kids. Hassan *et al.* (2010) obtained similar result, they reported higher birth weights for male kids of Jamunapuri goats. Reverse was the case for T_2 supplementation on male and female kids' weights. T_2 recorded higher (3.40kg) weight for female kids than male kids (3.15kg).

For weight distribution on birth type, single birth had higher weight (3.59kg) at birth than twin birth (2.81kg) for T_1 and T_3. This result is in agreement with Bawala *et al.* (2006) for West African Dwarf goats. T_2 had higher value for twin (3.35kg) than single (3.00kg) birth types, this result agreed with the report of Akingbade *et al.* (2001) in Year 1 of a study where he grazed Nguni goats differently on *Leucena*/grass mixture and natural pastures. Triplet birth had the least weight (2.47kg) compared to single and twin birth types, congruent to the report of Akingbade *et al.* (2001) for multiple births.

Conclusion

It may be concluded from the results obtained from this study that pregnant Kalahari Red does fed T_2 (14.18% CP at 145.87gday^{-1}) had improved litter weight at birth with resultant reduction in weights of pregnancy variables such as products of pregnancy and foetal growth rate.

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References

Acero-Camelo, A., Valencia, E., Rodríguez, A and Randel, P. F. 2008. Effects of flushing with two energy levels on goat reproductive performance. *Livestock Research for Rural Development.* (20) Article #136.

Akingbade, A.A., Nsahlai, I.V., Bonsi, M.L.K., Morris, C.D. and Du Toit L.P. 2001. Reproductive performance of South African indigenous goats inoculated with DHP- degrading rumen bacteria and maintained on *Leucaena leucocephala*/grass mixture and natural pasture. *Small Ruminant Research.* 39: 73-85.

Bawala, T.O., Akinsoyinu, A.O., Arigbede, M.A. and Babayemi, O.J. 2006. Effect of dietary protein utilization on reproductive performance of West African Dwarf Goats. *Journal of Animal and Veterinary Advances.* 5(10): 819-822.

Ćinkulov, M., Nebesni, A., Krajinović, M., Pihler, I. and Žujović, M. 2009. Biotechnology in Animal Husbandry. Institute for Animal Husbandry, Belgrade-Zemun. 25(1-2): 119-124.

Dayeh, R.A.A., Tabbaa, M.J. and Harb, M.Y. 1996. Effect of different feeding levels on the productive and reproductive performance of Shami (Damascus) goats in the Jordan Valley. *Dirasat Agricultural Sciences.* 23(2): 131-142.

Hassan, M.R., Talukder, M.A.I. and Sultana, S. 2010. Evaluation of the production characteristics of the Jamunapari goat and its adaptability to farm conditions in Bangladesh. *The Bangladesh Veterinarian.* 27(1): 26-35.

Hossain, M.E., Shahjalal, M., Khan, M.J. and Hasanat, M.S. 2003. Effect of dietary energy supplementation on feed intake, growth and reproductive performance of goats under grazing condition.

Pakistan Journal of Nutrition. 2(3): 159-163.

İnce, D. 2010. Reproduction performance of Saanen goats raised under extensive conditions. *African Journal of Biology*. 9: 8253-8256.

Jainudeen, M.R. and Hafez, E.S.E. 2000. Gestation, prenatal physiology, and parturition. *Reproduction in Farm Animals*. 7th Edition, Ed.: Hafez, B. and Hafez, E.S.E.; Lippincott Williams and Wilkins, USA: 140-155.

Joshi, L., Thakur, Y. A. and Vader, M. L. 2004. Improving goat production in semiarid regions through better nutrition management. In: The contribution of small ruminants in alleviating poverty: communicating messages from research. *Proc. of the 3rd DFID Livestock Production Programme link project workshop for small ruminant keepers*, Izaak Walton Inn, Embu, Kenya, 4-7 February, 2003 pp: 29-36.

Kawas, J.R., Andrade-Montemayor, H. and Lu, C.D. 2010. Strategic nutrient supplementation of free-ranging goats. *Small Ruminant Research*. 89: 234–243.

Martin, G.B., Rodger, J. and Balache, D. 2005. Nutritional and environmental effect on reproduction in small ruminants. *Reproduction Fertility Development*. 16: 491.

Mushi, D.E., Safari, J., Mtenga, L.A., Kifaro, G.C. and Eik, L.O. 2009. Effects of concentrate levels on fattening performance, carcass and meat quality attributes of Small East African × Norwegian crossbred goats fed low quality grass hay. *Livestock Science*. 124: 148–155.

Olomola, O.O., Babayemi, O.J. and Akinsoyinu, A.O. 2008. Performance characteristics and nitrogen utilization of pregnant West African Dwarf Goats fed groundnut cake, urea and rumen epithelial wastes in cassava flour and citrus pulp–based diets. *Tropical and Subtropical Agro-ecosystems*. 8: 61-67.

Osuagwuh, A.I.A. and Aire, T.A. 1990. Intra-uterine growth rates of the West African dwarf goats and some foetal organs in relation to strategic feed supplementation during pregnancy. *Journal of Veterinary Medicine*. 37: 198-204.

Peart, J.N., 1967. The effect of different levels of nutrition during late pregnancy on the subsequent milk production of Blackface ewes and on the growth of their lambs. *Journal of Agricultural Sciences (Camb.)*. 68, 365-371.

Rafiq, M., Khan, M.F. and Aujla, K.M. 2003. Economic benefits of flushing and supplemental feeding of salt-range ewes on pothwar ranges of Pakistan. *Pakistan Journal of Biological Science*. 6: 115.

Ramsay, K., Harris, L. and Kotze, A. 2001. Landrace Breeds: South Africa's Indigenous and Locally developed Farm Animals. *Publication Farm Animal Conservation Trust*, ISBN:0-620-25493-9.

Table 1: Pregnancy variables of gravid Kalahari Red does grazing on Rhodes grass (*Chloris gayana*) supplemented with three concentrate diets during pregnancy and after kidding

Parameters	Experimental concentrate diet T_1	T_2	T_3	SEM
Number of pregnant does	11.00	11.00	10.00	----
Pregnancy variables				
Products of pregnancy within 24hours before kidding (kg)	10.01^{ab}	9.28^{b}	10.35^{a}	0.19
Foetal growth rate during pregnancy ($gday^{-1}$)	85.74^{ab}	80.07^{b}	88.37^{a}	1.51
Afterbirth weight (kg)	3.23	3.04	3.38	0.35

[abc] Means on the same row having different superscripts were significantly different ($p<0.05$)

Table 2: Weight distributions of kids kidded by Kalahari Red does grazing on Rhodes grass (*Chloris gayana*) supplemented with three concentrate diets based on sex and birth types

Parameters	Experimental concentrate diet T_1	T_2	T_3	SEM
Litter weight at birth (kg)	**5.08^{b}**	**6.80^{a}**	**4.72^{b}**	**0.38**
Weight distribution on sex (kg)				
Birth weight	3.19	3.20	3.16	0.13
Male kids	3.23	3.15	3.18	0.18
Female kids	2.96	3.40	2.88	0.17
Weight distribution on birth type (kg)				
Single	3.67	3.00	3.50	0.13
Twins	2.91	3.35	2.70	0.18
Triplets	0.00	2.47	0.00	----

[ab] Means on the same row having different superscripts were significantly different ($p<0.05$)