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EFFECTS OF DIFFERENT SUPPLEMENTS ON MILK YIELD AND COMPOSITION OF RED SOKOTO GOATS IN ADAMAWA STATE

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ABSTRACT

The study was carried out to investigate the effect of dietary supplement on milk production of Red Sokoto goat in Adamawa state. The study was conducted in the Benue trough block where more than 50% of the goat populations of the state were found. What was the design of the experiment based on supplements offered. The milk composition values increased during mid-lactation and declined during late lactation. Significant differences ($P<0.05$) in all values existed during late lactation. The values increased and reached peak during mid-lactation and then declined during late-lactation. Significant differences ($P<0.01$) existed during late-lactation and was highest in the group supplemented with cotton seed cake and least in the control group, lactose values also reached peak during mid-lactation and started declining. Supplement feed intake during second parity in the parent stock also showed significant ($P<0.001$) differences between groups with the highest intake recorded in the group receiving groundnut haulms and the least in the group receiving cotton seed cake. The proximate composition of milk from does during second parity showed that the pH level showed significant ($P<0.05$) differences among treatment groups and the level increased during mid-lactation and then declined. Total solids also showed differences ($P<0.05$) between treatment groups, the values were similar during early and late-lactations. The result shows that treatment T3 performed better with significantly ($P<0.5$) higher milk yield, protein and total solids at early and mid-lactation respectively in second parity. Supplementation treatment diet T3 showed positive impact on all parameters measured and may well be recommended.

Keywords: Milk composition, milk production, Red Sokoto goat, supplementation

INTRODUCTION

The major problem facing the third world countries is how to increase the biological value of their menu, improve and maintain the productive potentials of their domestic livestock, given adverse ecological and physiological constraints (Okonkwo *et al.*, 2011). Many developing countries have for long been plagued with the problem of a worsening situation of inadequate consumption of animal protein especially milk (Zahraddeen *et al.*, 2010). The energy and protein intake are grossly inadequate in these countries, leading to low weight for age, and height, various degrees of stunting, higher susceptibility to disease



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infections, high pre-weaning morbidity and mortality most especially among children who are vulnerable (PRB, 2012). In most tropical countries of Africa, population growth has outstripped food supply. This has brought persistent call for the improvement of the nutritional status of the citizens through substantial increase in the intake of animal protein. An average Nigerian takes about 7.5g of protein daily. This level is far below the recommended level of 36 g. This low protein intake is connected with the fact that the production of large animals with slow production rate is given more encouragement than short cycle animals with high fecundity rate, low cost of investment, small body size which make it suitable for backyard rearing and easy consumable by a family (Ohagenyi *et al.*, 2012). The purpose of the study was to effects of different supplements on milk yield and milk composition of Red Sokoto goats in Adamawa State

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Teaching and Research Farm of the Department of Animal Science and Range Management, Modibbo Adama University of Technology, Yola, located in the northeastern part of the country, it is situated within the Guinea savanna region and lies between latitude 09.14°N and longitude 12.8°E and an altitude of 152m above sea level. Average temperature is 29°C and an annual mean rainfall of 1150mm (Adebayo and Tukur, 1999).

Experimental Animals and Management

Twenty (20) Red Sokoto goats were purchased from the identified local farmers known to milk goats which proved to be good milkers. The animals were ear tagged and weighed at the beginning of the experiment. They were reared for two weeks adaptation period. The experiment lasted for fourteen (14) months. Semi-intensive system of management was adopted in managing the animals. The animals were divided into 4 treatments (T1-T4) of 5 animals each with treatment 1 as control. T1 was the control and receives no supplement.

Experimental Diets

Maize bran was purchased from small scale mills in Yola metropolis and sundried to avoid molding. Cotton seed cake was purchased from stores in Yola. It was milled to reduce the size for feeding. Similarly, groundnut haulms were purchased on-farm. They were crushed and bulk in bags prior to the study period and ensured that sufficient quantity was made available for the animals up to when new ones were available.

Treatments and Experimental Design

Twenty (20) Red Sokoto goats were randomly allocated to four (4) treatment diets. (T1, T2, T3 and T4) Replicated five (5) times in a Randomized Block Design (RBD).

Data Collection

Data was collected on the following parameters

Feed Intake: The Daily feed intake of the supplemental diets was obtained by subtracting the left over from the total feed supplied for the day. The supplement was given to the animals after grazing.

Body Weight Changes: Initial body weights of the experimental animals were measured before the onset of the experiment while subsequent body weight measurements were done weekly. The weight gain per animal was determined by subtracting the weight before the beginning of the experiment from the final weigh divided by the number of days the experiment lasted.

Milk Production

After kidding the does were milked daily in the morning to determine the partial daily milk yield of the does. Milking was done for up to three months by hand milking. Does were separated from their kids at 6:00pm till after milk collection the next morning at 6:00 – 7:00am. Milk yield were measured using a weighing balance immediately after collection. The milk collected was defined as the partial daily milk yield (PDM) which is a combination of milk off-take and 12hour milk yield. Milking was done for first and second parities for three months each. The proximate composition of the milk was done in three different stages; at early lactation, mid-lactation and late lactation. Fat was estimated by Gerber methods (A.O.A.C, 1995). Protein was determined by Kjeldahl method. Ash content was determined by igniting the dry sample at 500°C (A.O.A.C, 1995).

Chemical Analyses

The proximate compositions of the different supplements and milk composition were determined using (AOAC, 1995).

Statistical Analyses

The data collected from the four treatment groups were analysed for variance using a complete randomized block design procedure (Steel and Torrie, 1980). While significant differences between treatment means were determined using LSD.

RESULT AND DISCUSSION

Chemical Composition of the Supplemental Feeds is presented in Table 1

Table 1. Chemical Composition of the Supplemental Feeds (% DM basis)

Diets	DM	CP	CF	ASH	EE
Maize bran	92.23	10.53	10.53	1.16	1.89
Cotton seed cake	93.60	29.94	23.50	5.16	5.76
Groundnut haulms	93.65	15.63	23.26	7.67	2.06



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Proximate composition of milk from does during first parity in the study

Milk Yield: The milk yield values were 35.530, 32.218, 39.263 and 28.433kg for the different treatment groups with no significant difference among the treatment groups. The values were higher in the group supplemented with cotton seed cake, followed by the control group. Treatment two (2) which is supplemented with maize bran is the next and the least values were recorded in the group supplemented with groundnut haulms.

Table 2. Proximate Composition of Milk from Does during First Parity in the study

Parameters	Treatments				SEM
	T1	T2	T3	T4	
Feed intake	0.000 ^c	30.235 ^b	30.550 ^b	34.275 ^a	0.042***
Milk yield (kg)	35.530	32.218	39.623	28.433	5.505Ns
Early Lactation					
PH	6.2130	6.320	6.2530	6.2880	0.047Ns
Total Solids	12.635	12.698	12.723	12.638	0.039Ns
Crude Protein	3.9230	3.7180	3.4730	3.5800	0.136Ns
Fat	3.6650	3.6980	3.6400	3.7800	0.061Ns
Lactose	3.8780	3.9480	3.9350	3.8730	0.085Ns
Ash	0.8080	0.7900	0.7150	0.7480	0.063Ns
Mid-Lactation					
PH	6.2930	6.3030	6.2950	6.3500	0.22Ns
Total Solids	11.553	11.495	11.480	11.568	0.047Ns
Crude Protein	3.3680	3.3530	3.3330	3.3750	0.016Ns
Fat	4.6250	4.5880	4.6000	4.5630	0.22Ns
Lactose	4.4050	4.4000	4.3730	4.4050	0.016Ns
Ash	0.9580 ^b	1.1450 ^a	1.1000 ^a	1.1380 ^a	0.039*
Late Lactation					
PH	6.1130	6.1380	6.1350	6.1580	0.022Ns
Total Solids	11.553	11.670	11.595	11.645	0.027Ns
Crude Protein	3.6930	3.2080	3.1850	3.1980	0.136Ns

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Fat	4.1530 ^{ab}	4.155 ^{ab}	4.1730 ^{ab}	4.1450 ^b	0.000*
Lactose	4.0850 ^b	4.1150 ^b	4.1480 ^a	4.1050 ^b	0.000**
Ash	0.8030 ^b	0.9680 ^a	0.9930 ^a	0.8550 ^b	0.016***

Means with different superscripts within a row are significantly different NS – Not Significant; SEM – Standard error of mean; * (P<0.05); ** (P<0.01); *** (P<0.001)

The result of the proximate composition of milk obtained from the parent stock during early lactation first parity did not show any significant difference between all the treatment groups for pH, total solids, crude protein, fats, lactose and ash. However, the result recorded from the proximate analysis of milk during mid-lactation also did not show any significant difference between all the treatment groups for PH, total solids, crude protein, fats and lactose. But the values recorded for ash showed a significant (P<0.05) difference between the treatment groups. The highest value was recorded in treatment two (2) (1.145) which was followed by treatment four (4) (1.138), then treatment three (3) (1.100) while the least value was recorded in the control group (0.958), the result is in agreement with (Novotná *et al.*, 2009; Marković, *et al.*, 2020).). The significant increase of milk fat with increasing parity found in this study was in line with the findings of (Novotná *et al.*, 2009). Also in contradiction to the report of Beyene and Seifu, (2005) was non-significant effect of stage of lactation on total solid. The authors observed increase in total solid to a maximum at mid lactation and decreased hereafter as opined by (Marković, *et al.*, 2020).

The proximate composition of milk from does during second parity is presented in Table 3. The results showed that milk yield showed significant (P<0.05) differences among treatment groups and the level increased during mid-lactation and then declined. Total solids also showed differences (P<0.05) between treatment groups, the values were similar during early and late-lactations. Crude protein records also showed significant difference (P<0.05) between groups, the values increased as lactation progressed.



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Second Parity

Table 3. Proximate Composition of Milk at Second Parity.

	Treatments				
Parameters	1	2	3	4	SEM
Early - Lactation					
PH	6.328 ^b	6.378 ^{ab}	6.410 ^a	6.355 ^b	0.016*
Total Solids	11.598 ^b	11.725 ^b	11.885 ^a	11.658 ^a	0.045*
Crude Protein	3.403 ^b	3.508 ^a	3.548 ^a	3.405 ^b	0.022*
Fat	4.680 ^b	4.658 ^b	4.728 ^a	4.600 ^c	0.016***
Lactose	4.423 ^c	4.523 ^b	4.793 ^a	4.490 ^{bc}	0.022***
Ash	1.103 ^b	1.215 ^a	1.263 ^a	1.113 ^b	0.027**
Mid - Lactation					
PH	6.365	6.383	6.395	6.360	0.27Ns
Total Solids	11.640 ^b	11.908 ^a	11.845 ^a	11.645 ^b	0.047**
Crude Protein	3.423 ^b	3.533 ^a	3.425 ^b	3.405 ^b	0.022*
Fat	4.663	4.750	4.723	4.674	0.027Ns
Lactose	4.398 ^c	4.515 ^{bc}	4.705 ^a	4.583 ^{ab}	0.039**
Ash	1.230 ^{ab}	1.225 ^{ab}	1.308 ^a	1.143 ^b	0.035*
Late - Lactation					
PH	6.328 ^b	6.378 ^{ab}	6.410 ^a	6.355 ^b	0.016*
Total Solids	11.598 ^b	11.705 ^b	11.885 ^a	11.668 ^b	0.045*
Crude Protein	3.463 ^b	3.568 ^a	3.598 ^a	3.405 ^b	0.022**
Fat	4.670 ^b	4.658 ^b	4.708 ^a	4.606 ^c	0.016***
Lactose	4.423 ^c	4.503 ^b	4.798 ^a	4.496 ^{bc}	0.022***
Ash	1.108 ^b	1.216 ^{ba}	1.263 ^a	1.173 ^b	0.027**

Means with different superscripts within a row are significantly different; NS – Not Significant; SEM– Standard error of mean; * (P<0.05); ** (P<0.01); *** (P<0.001)

The fat values also showed differences (P<0.001) during early and late lactations and it decreased as lactation progressed. Lactose content of milk also showed significant (P<0.001) differences between treatment groups during second parity in all the three lactation stages. While ash values are almost similar

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during early, mid and late-lactations and showed significant ($P < 0.01$) differences between groups during the three stages of lactation.

Conclusion

Milk yield was better in the group receiving cotton seed cake while the least was recorded in the group receiving groundnut haulms. Cotton seed cake has shown to be the best supplement for milk production in the study area. The composition of goat milk observed in this study is comparable to those reported elsewhere. Supplementation reduces kidding interval and milk yield improves as parity level increases. The number of days it takes the does to attain puberty is affected by supplementation and supplementation with cotton seed cake produces the least puberty period.

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