

THE EFFECTS OF BREED, SEASON AND PARITY ON MILK COMPOSITION OF THREE SHEEP BREEDS IN THE SEMI-ARID ENVIRONMENT

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ABSTRACT

A total of 36 ewes, comprising of 12 each of Uda, Yankasa and Koroji breeds were used for the study. They were replicated three times in a group of four animals per pen. A healthy matured ram of the selected breeds was included for breeding purpose in each of the pens and the ewe were tagged for easy identification. Milk yield was measured daily using a measuring cylinder (in mls). Milk sample (100 ml) from each breed was taken weekly for analysis to determine percentage crude protein (CP), crude fat (CF), dry matter (DM), moisture (M), ash and lactose. The data was subjected to analysis of variance using the general linear model of SAS package (1999). Significant means were separated using the least significant difference (LSD). The results show that breed had no significant effect ($P>0.05$) in all the milk composition parameters studied except lactose ($P<0.05$) where significant difference was observed. Yankasa had the highest value (4.72%) followed by Koroji (4.67%) and Uda (4.49%). The effect of season also significantly affected ($P<0.05$). Milk produced during dry cold (Oct-Jan) season had significantly higher lactose. This study could serve as a baseline for selection of breed suitable for milk production in the semi-arid environment.

Key words: Breed, Season, Parity, Milk and Composition

INTRODUCTION

Small ruminants (sheep and goats) are important domestic animals in arid and semi-arid regions of the tropics. They are primarily raised in a traditional manner and there is little organized effort to improve their productivity. They contribute meat, milk, skin, fibre and manure and are the sole or subsidiary source of livelihood for a large number of small scale farmers, the variation in performance among breeds of sheep provides the possibility for selection of breeds best suited to various production objectives, environment and management systems (Dikerson, 1978). In Nigeria, there are generally four native breeds of sheep which are Balami, Uda, Yankasa and West African Dwarf (WAD). There is however Koroji breed of sheep which is predominantly found in Borno and Yobe states. It is fast growing, white in colour, early maturing and is originally a native of Chad republic but is now predominantly found in Maiduguri where they outnumber Balami breed. They are mostly kept for meat and skin. Its potential for milk has not been harnessed in Nigeria and this leads to a dearth of information on the nutritive value of their milk in literature.

Milk composition of ewes has been reported to vary over a wide range because of differences in breeds (Lobo *et al.*, 2017). The contents and levels of major and minor components in milk are affected by the stage of lactation (Koutsouli *et al.*, 2017), daily variation, season, parity and type of birth (Selvaggi *et al.*, 2016), type of diet (Catunda *et al.*, 2016), physiological status and health of udder (Caroprese *et al.*, 2010). It's unique properties, distinguishes it from cow's milk and makes it a valuable alternative not just for infants but also for adults and especially nursing mothers (Razafindrakoto *et al.*, 1993). The high solids content of ewe's milk enables production of superior yogurt compared to cows and most goats milk (George, 2001).

Milk yield variations between breeds i.e. potential of production, mammary morphology and cisternal capacity could be one of the main factors responsible for the variable and contradictory results reported in literature (Labussiere, 1988). Genetic differences in milk composition within species have been reported for the ewes. Therefore the objective of this study was to determine the effect of breed, season and parity on milk composition of three sheep breeds in semi-arid environment.

MATERIALS AND METHODS

Study Area

The study was conducted at the Livestock Teaching and Research Farm of the Department of Animal Science, University of Maiduguri, Borno State. Maiduguri is located within the Sahelian (semi-arid) region of west Africa on an elevation of 354 m above sea level in the North Eastern part of Nigeria, at Latitude 11.51° North and Longitude 13.05° East (NOAA, 2016). Characterized by three distinct seasons namely: Wet (June-September), dry cold (October- January) and dry hot (February-May). The hottest season is between April and May, which is characterized with bright sunny day and the atmospheric temperature fluctuates between 40° and 45°C (Weather and climate.com, 2010-2020). During the rainy season, the temperature may drop to about 30°C or less. The peak of rainfall is August where precipitation may exceed 198.6 mm while the relative humidity may reach up to about 45% in the wet season which drops to about 5-10% during the dry cold season (NOAA, 2016)

Experimental Animals

A total of 36 ewes, comprising of 12 each of Uda, Yankasa and Koroji breeds were used for the study. The animals were procured from Maiduguri cattle market and quarantined for two weeks during which they were monitored and observed for possible defects and abnormalities. They were replicated three times in a group of four ewes per pen. A healthy matured ram of the selected breeds was included for breeding purpose in each of the pens and the ewes were tagged for easy identification and data collection. The animals were quarantined for two weeks and treated against internal and external parasites. They were managed under semi intensive system. Lambs were separated from their dams after grazing and a concentrate diet comprising of wheat offal, maize bran, cowpea husk and corn husk in the ratio of 1:1:2:2, respectively was offered *ad libitum*. During the dry season the basal diet consisted of groundnut haulms.

Data collection and statistical analysis

Milking was carried out four days post-partum which gave lambs access to sufficient colostrum. The ewes were hand milked once daily between 7 and 9 am and were allowed to graze with their lambs from 9 am to 12 noon. Milk yield was measured daily using a measuring cylinder (in mls). Milk sample (100 ml) from each breed was taken weekly for analysis to determine milk composition. All necessary farm management practices were strictly adhered to and observed. The milk samples were analyzed weekly in the laboratory immediately after collection for dry matter, moisture content, crude protein, crude fat, Ash and lactose. The data was subjected to analysis of variance using the general linear model of SAS package (1999). Significant means were separated using the least significant difference (LSD). The experiment lasted for 19 months.

RESULTS AND DISCUSSION

The results of the effects of breed, season and parity on milk composition are presented in Tables 1,2 and 3, respectively. The effect of breed in Table 1, shows no significant effect ($P>0.05$) in all the milk composition parameters studied except lactose ($P<0.05$) where significant difference was observed. Yankasa had the highest value (4.72%) followed by Koroji (4.67%) and Uda (4.49%). The effect of season also significantly affected ($P<0.05$) lactose percentage. The results shows that milk produced in the dry cold (Oct-Jan) had significantly higher lactose. Parity was not significant in all the traits studied. The values of crude protein obtained (9.46% to 11.07%) are higher than 4.0- 4.48% in Barki sheep (Maharem, 1996); 4.9% in Ossimi sheep (Morsy, 2002) and 5.21% in Rambouillet ewes (Cardellino *et al.*, 2002) similar to the range of 4.1% to 11.20% reported for New Zealand breeds (Broadhurst *et al.*, 2016). The values obtained for fat% were similar to that of Barki sheep (Maharem, 1996); but lower than 6.5% reported for Ossimi sheep (Morsy, 2002) and local Sohagi sheep (5.46%) reported by Kassab *et al.* (2009). The values of Ash (0.76 and 0.85%) and moisture (82.9 and 81.0%) contents were higher than the values reported by Adewumi and Olorunnisomo (2009) for West African Dwarf ewes (0.76% and 0.85%) during the first and second lactations.

Milk on the average contains approximately 4.9% Carbohydrates that is predominantly lactose. Lactose obtained in the present study is adequate enough to satisfy the requirements of their lambs. The reduction in the lactose level by season could be due to feed availability. The season (dry cold) which favours increased lactose is usually the harvest period when animals graze freely without restrictions, the exposure of the animals to higher environmental temperature stimulates decrease in feed intake which could be the adaptive mechanism to produce less body heat (Marai *et al.*, 2007).

The reduction in lactose secretion is a strategy to maintain stable glycaemia (Hamzaoui *et al.*, 2013). Milk with a low level of lactose has a high level of inorganic salts or other compounds to maintain the osmotic pressure (Fox and McSweeney, 1998). Lactose is a very important parameter; it is converted to lactic acid and during the production of hard cheeses and the lactose is set free in the whey. There is also proof that the lactose in sheep milk is more acceptable to people than that of other types of milk, even in case of people with high lactose intolerance (Woodslanddairy.co.uk, 2018).

Table 1. Least Square Means $\pm$ Standard Errors of the Effects of Breed on Milk Composition (%) of Sheep Breeds

BREED	DM	M	CP	CF	ASH	LACTOSE
	NS	NS	NS	NS	NS	*
Yankasa	15.44 $\pm$ 0.55	84.52 $\pm$ 0.51	11.07 $\pm$ 0.44	3.95 $\pm$ 0.15	3.54 $\pm$ 0.85	4.72 $\pm$ 0.12 ^a
Koroji	13.70 $\pm$ 0.66	86.0 $\pm$ 0.62	9.89 $\pm$ 0.53	3.90 $\pm$ 0.18	3.74 $\pm$ 0.10	4.67 $\pm$ 0.14 ^b
Uda	14.57 $\pm$ 0.96	85.43 $\pm$ 0.90	9.46 $\pm$ 0.77	4.04 $\pm$ 0.26	3.53 $\pm$ 0.14	4.49 $\pm$ 0.21 ^c

a, b, c means within same column having different superscripts differ significantly ($p < 0.05$). DM: dry matter, M: moisture, CP: crude protein, CF: crude fat. NS: not significant

Table 2. Least Square Means $\pm$ Standard Errors of the Effects of Season on Milk Composition (%) of Sheep Breeds

SEASON	DM	M	CP	CF	ASH	LACTOSE
	NS	NS	NS	NS	NS	*
Dry Hot	14.63 $\pm$ 0.58	85.20 $\pm$ 0.58	10.81 $\pm$ 0.47	4.03 $\pm$ 0.15	3.53 $\pm$ 0.09	4.32 $\pm$ 0.12 ^b
Dry Cold	14.29 $\pm$ 1.52	85.55 $\pm$ 1.42	9.65 $\pm$ 1.22	3.88 $\pm$ 0.41	3.63 $\pm$ 0.23	5.01 $\pm$ 0.33 ^a
Wet	14.79 $\pm$ 0.45	85.21 $\pm$ 0.42	9.97 $\pm$ 0.36	3.98 $\pm$ 0.12	3.66 $\pm$ 0.69	4.55 $\pm$ 0.09 ^b

a,b, means within same column having different superscripts differ significantly ($p < 0.05$). DM: dry matter, M: moisture, CP: crude protein, CF: crude fat. NS: not significant

Table 3. Least Square Means $\pm$ Standard Errors of the Effect of Parity on Milk Composition (%) of Sheep Breeds

PARITY	DM	M	CP	CF	ASH	LACTOSE
	NS	NS	NS	NS	NS	NS
1	14.43 $\pm$ 0.74	85.38 $\pm$ 0.69	9.69 $\pm$ 0.59	3.91 $\pm$ 0.20	3.57 $\pm$ 0.11	4.65 $\pm$ 0.16
2	14.71 $\pm$ 0.60	85.26 $\pm$ 0.55	10. $\pm$ 0.48	4.01 $\pm$ 0.16	3.64 $\pm$ 0.09	4.60 $\pm$ 0.13

DM: dry matter, M: moisture, CP: crude protein, CF: crude fat. NS: not significant

CONCLUSION AND RECOMMENDATION

Based on this study, breed, season and parity had no substantial effects on the milk composition of sheep in this region with the exception of lactose. Further research can be conducted beyond parity two to ascertain the results and exploitations in the study area.

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