

## Effect of Pendulous Udder Enlargement on Yield and Proximate Composition of Milk from Red Sokoto Goats

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**Abstract:** Forty Red Sokoto does (20 with normal-sized udders and 20 with enlarged pendulous udders) in early to mid-lactation, corresponding to the first 8 weeks of lactation, were used to estimate yield and proximate composition of milk. Does with normal-sized udders yielded 79% more milk ( $p < 0.05$ ) daily than those with enlarged pendulous udders. Milk obtained from enlarged pendulous udders tested positive for mastitis and its composition altered due to mastitis. Protein and solids-non-fat in milk from pendulous udders significantly ( $p < 0.05$ ) increased relative to that in normal-sized udders. Changes in fat, total solids and ash were minimal. Milk obtained from pendulous udders had an altered Ca: P ratio, while, phosphorus content of milk was markedly ( $p < 0.05$ ) reduced for does with pendulous udders.

**Key words:** Milk yield, milk composition, enlarged udders, mastitis

### INTRODUCTION

The development of enlarged pendulous udders in some Savannah breeds of goats is fairly common (Addo *et al.*, 1980; Chineme and Addo, 1984; Kawu *et al.*, 1992; Egwu *et al.*, 1994). The pathology of enlarged pendulous udders and most of the micro-organisms present in these glands for Red Sokoto goats, in normal and mastitic states, have been reported (Chineme and Addo, 1984; Kawu *et al.*, 1992; Egwu *et al.*, 1994; Alawa *et al.*, 2000).

Pendulous udder development in Red Sokoto goats, when it occurs, starts after first kidding and leads gradually to udder dysfunction if not treated, causing a significant number of kids in subsequent parturitions to starve to death due to lack of milk (Alawa *et al.*, 1997). In same study, some kids suckling dams with enlarged pendulous udders scoured. Agbede *et al.* (1997) assessed udder size and milk production potentials in West African Dwarf goats and sheep. No information is available on the Maradi.

The present study was therefore, designed to determine effects of pendulous udder enlargement on yield and changes in milk composition in Red Sokoto (Maradi) goats.

### MATERIALS AND METHODS

Forty Red Sokoto does, 20 with normal-sized udders and 20 with bilaterally enlarged pendulous udders in early

to mid-lactation, were randomly selected from locally raised herds in Zaria, Nigeria. The does in all the locations were semi-intensively managed during the study period which was in early wet season (May-July). They were normally allowed out to graze daily at about mid-day and returned to their pens before night fall. For milk collection, the does were adapted to a regime of placing concentrate feed in their respective pens, hand-milking them before letting the kids suckle. After placing the feed, the udder and teats of each doe were washed with lukewarm water and cleaned with cotton wool soaked in 70% alcohol. Following release of the fore milk, samples were collected by hand-stripping into previously sterilized screw-capped bottles. Milk yield was measured for 12 weeks as described by Ehoche *et al.* (1990) but without injection of oxytocin, as this was not allowed by most herd owners.

In order to confirm the reaction of milk from the various quarters of the udder, samples of milk from each udder were screened in a routine mastitis test using the modified Whiteside method (Murphy and Hanson, 1941) and based on degree of reaction, were scored.

Milk fat concentration was estimated by the Gerber's method (MAFF, 1974), while, total solids (TS) concentration was determined by evaporation to dryness. Solids-non-fat concentration was obtained by the difference between TS concentration and milk fat. Protein was obtained using the Kjeldahl method ( $\%N \times 6.38$ ) and ash by AOAC (1990) method. Calcium, sodium and potassium were determined by wet digestion using Atomic Absorption Spectrophotometer (AAS) Model 290

(Willis, 1960). Magnesium and iron were determined using Perkin-Elmer's (1976) AAS method. Phosphorus was obtained using the method of Young (1966).

**Statistical analysis:** Data on yield and composition of milk were subjected to analysis of variance, while, differences between means were assessed by Student's t-test.

### RESULTS

The results in Table 1 showed that about 20% of samples of milk from apparently normal-sized udders were positive for mastitis in contrast to approximately 77% of the milk from pendulous and enlarged quarters of udders which were clearly mastitic. Table 2 further showed that apparently unaffected does with normal-sized udders produced relatively higher quantities of milk than does with enlarged pendulous udders, although, the difference was not statistically significant ( $p > 0.05$ ). The fat, total solids and ash percentages in the milk were not influenced by udder shape but protein and solids-non-fat contents were significantly ( $p < 0.05$ ) higher in the milk emanating from mastitic udders. While, calcium and phosphorous contents were slightly reduced in milk from affected does as compare to milk from does with normal udders, other mineral contents of milk except iron, were generally similar

Table 1: Mastitis test response form normal (n = 20) and enlarged pendulous (n = 20) udders

Source and percent of milk showing reaction		
Score	Normal	Enlarged
-	70.38	10.39
±	9.14	12.25
1+	10.22	36.81
2+	7.18	27.47
3+	3.07	8.09
4+	0.00	5.00

-Negative; ; ± Neutral 1+ to 4+ Varying degrees of positive reaction

Table 2: Yield and proximate composition of milk obtained from Red Sokoto does with normal-sized (n = 20) or enlarged (n = 20) udders

Parameters	Type of udder		
	Normal	Enlarged	SE
Milk yield (g d <sup>-1</sup> )	522	291	31.10
<b>Milk components (%)</b>			
Protein	5.50	6.700	0.1100
Fat	5.70	5.200	0.5800
Solids-non-fat	11.40	12.000	0.7300
Total solids	17.10	17.200	2.1600
Ash	0.82	0.870	0.0300
Potassium	0.03	0.020	0.0030
Calcium	0.20	0.040	0.0040
Phosphorus	0.13	0.080	0.0020
Magnesium	0.14	0.130	0.0020
Sodium	0.08	0.140	0.0050
Iron	0.01	0.003	0.0076

for affected and unaffected does. The iron contents of milk obtained from does with normal udders was three times higher in milk from does with enlarged pendulous udders.

### DISCUSSION

The varying degrees of intensity of the reaction of milk from enlarged pendulous udders to mastitis test in the present study indicates that does with such enlarged pendulous udders had mastitic conditions ranging from sub-acute, to chronic cases. The very few cases of mastitic milk obtained from apparently normal-sized udders are indicative of sub-clinical mastitis with little, if any, observable signs-a fairly common occurrence in Red Sokoto goats (Addo *et al.*, 1980; Alawa *et al.*, 2000).

The present study has shown that mastitis and the accompanying udder enlargement caused a reduction in milk yield by about 44%. Such an adverse effect on milk yield would have implications for the nutrition of kids born to mastitic does. This further corroborated earlier observation that kids born to mastitic does with enlarged udders starved to death (Addo *et al.*, 1980). This finding is probably due to increasing dysfunctional status of the udder of affected does following shrinkage of the alveolar cells which produce milk as previously reported on the histopathology of enlarged pendulous udders (Alawa *et al.*, 2000). However, the daily milk yield obtained from healthy Red Sokoto goats in the present study (522 g) was close to 545 g reported by Ehoche and Buvanendra (1983), but higher than 233 g obtained by Sankey (1991) from does of the same breed.

The increase in milk protein caused by mastitis in the present study may be attributed to an increase in cell count characteristic of mastitic milk, which is a reflection of poor milk quality. This poor milk quality was also reflected in the altered Ca:P ratio of 0.05:0.1 relative to 1, 5:1.0 for normal doe milk as shown in milk from normal adders in this study. The implication of this result is that kids suckling milk from affected does would require calcium supplementation.

In comparison with previous studies using Red Sokoto does (Table 3), the protein content of normal milk in the present study (5.5%) is slightly higher than previously reported values of 4.5% (Mba *et al.*, 1975), 4.6% (Sankey, 1991) and 3.8% (Ehoche and Buvanendran, 1983). The fat (5.7%) compares with 5.32 (Mba *et al.*, 1975), 4.30 (Sankey, 1991) and 4.75% (Ehoche and Buvanendran, 1983) reported for the same breed. Also, values of solids-non-fat and total solids in this study, were 11.4 and 17.1%, respectively, as compared with previously reported lower values of 10.53 and 15.83% by Mba *et al.* (1975), 13.63 and 0.73% by Sankey (1991).

Table 3: Milk composition of various goat breeds

Author	Breed	Composition (%)					
		Yield	Protein	Fat	SNF	ST	Ash
Jandal (1996)	Indian	-	2.90	3.80	8.68	-	0.79
Mba <i>et al.</i> (1975)	Red Sokoto	-	4.47	5.32	10.53	15.83	-
Mba <i>et al.</i> (1975)	West African dwarf	-	5.3	7.78	10.48	18.18	-
Mba <i>et al.</i> (1975)	Saanen	-	4.36	5.48	9.97	15.47	-
Sankey (1991)	Red Sokoto	233	4.69	4.30	13.69	0.79	-
Ehoche and Buvanendran (1983)	Red Sokoto	545	3.83	4.75	-	-	-

### CONCLUSION

The present results have shown that milk from enlarged pendulous udders is predominantly mastitic. The development of enlarged pendulous udders as a result of mastitis caused a reduction in the quantity and quality of milk yielded by affected does with a consequent alteration in the chemical and mineral composition of the resultant milk.

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