

Udder Shapes and their Relationship with Udder Size in Red Sokoto and West African Dwarf Goats

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Target Audience: Goat farmers, researchers and animal scientists

Abstract

One hundred and thirty Red Sokoto (RS) and one hundred and eight-five West African Dwarf (WAD) goats were evaluated for the effects of udder shape on udder size. Effects of udder shape were highly significant ($P < 0.01$) on udder size in both breeds of goats. Udder characteristics measured included udder length (UL), udder width (UW), udder circumference (UC) and distance between teats (DT). Bowl shaped udder was significantly ($P < 0.01$) superior in size to cylindrical, round and funnel shaped udders in the two breeds. In RS goats values of UL and UC for bowl udder were 14.52 ± 0.31 and 28.87 ± 0.52 cm respectively, while corresponding lower values obtained for cylindrical shape were; 12.94 ± 0.33 and 24.39 ± 0.55 cm; and round udder 12.01 ± 1.54 and 24.64 ± 2.54 cm and funnel udder 12.06 ± 0.66 and 22.83 ± 1.08 cm respectively. For WAD goats UL and UC values recorded for bowl udder were 13.30 ± 0.89 and 28.80 ± 1.31 cm respectively. Results obtained for cylindrical udder, were 10.78 ± 0.90 and 22.18 ± 1.35 cm and for funnel udder 11.30 ± 1.87 and 16.26 ± 3.65 cm respectively. These results showed that bowl shaped udder was larger than other types of udder in the indigenous goats and hence suggest larger capacity for milk production.

Keywords: Udder shapes, Red Sokoto and West African Dwarf goats

Description of Problem

Identification of appropriate and simple traits for screening indigenous goat breeds for milk production is still a problem in Nigeria. Such traits if found to be morphological or external on the body of goats could assist in selection programme for goat milk production. Even an average rural goat farmer would find it convenient to appraise the goats with high potential for milk yield.

Shape of udder is one of the traits that could influence the size of udder, and, consequently relate to milk yield. Udder characteristics, milk production and milking time are traits with adequate genetic variation that could facilitate selection response (1, 2 and 3). Montaldo and Martinez - Lozano (4) reported superiority of globular udders over non-globular udders for non-

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mastitis test, milking rate, udder perimeter and milk yield of goat.

Bowl shaped udders were larger than round and irregular shaped udders, and consequently produced more milk. (5). Shape and placement of udder also formed important conformation traits for sustainable milk production. However round shaped udder yielded highest (6).

Information on udder shape and its association with udder size is lacking for indigenous goats in Nigerian. Since milk yield to a large extent is a function of udder size, it could be meaningful to determine the relationship between udder shape and udder size in indigenous goats. Hence the objective of this study was to determine the effects of udder shape on udder size of West African Dwarf (WAD) and Red Sokoto (RS) goats.

Materials and Methods

Animals, location and management

Two breeds of goats, West African Dwarf (WAD) and Red Sokoto (RS) were involved in this study. A total of 315 goats comprising 130 RS and 185 WAD were used. Out of the 130 RS goats 118 were from the herds at the National Animal Production Research Institute (NAPRI), Shika, Zaria and the rest from farmers' flocks in (Tsbiri and Muuta of Giwa Local Government Area of Kaduna State). However, the 185 WAD goats were from farmers' flocks within Ogbomoso North and South Local Government Areas of Oyo State and Alabata of Odeda Local Government Area of Ogun State, South Western Nigeria. The study was conducted between November 1997 and September 1998. Goats at NAPRI were managed under semi intensive system, all others were managed under extensive system. Does of between 1 to 5 years of age were used and those with abnormal udders were not included.

Udder measurement

Measurement of udder included udder length (UL), udder width (UW), udder

circumference (UC) and distance between teats (DT). The measurement was accomplished by means of a flexible tape rule (4) Udder length was measured from the base of udder to the lowest point of the udder. Udder width and circumference were measured at the widest point of the udder. Distance between the tips of two teats were also measured. Age of does was determined with dentition method (7 and 8).

Udder Shape

Udder shape of each goat was evaluated by visual observation as described [Johnson and Rendal(9)] and classified accordingly.

Statistical analysis

Data collected were analysed for the effect of shape of udder on size of udder using mixed model least squares and maximum likelihood computer package (10). This package was used due to unequal nature of the data. The package was used due to unequal nature of the data. The model used is as follows;

Y_{ij}	= $\mu + S_i + A + \hat{a}_{ij}$
Where Y_{ij}	= The value of trait of interest (udder dimension i.e. UL, UW, UC, or DT)
μ	= Overall mean
S_i	= Fixed effect of ith shape of udder (i=1-4 for RS goat; i=1-3 for WAD goat)
A	= Age used as covariate
Σ_{ij}	= Random error associated with each record.

Significant differences between means were determined using Duncan's New Multiple Range Test (11).

Results and Discussion

Summary of the results of this study is shown in Tables 1 to 3. Mean squares of udder traits due to the effect of udder shape for both Red Sokoto (RS) and West African Dwarf (WAD) goats are presented in Table 1. The mean squares were highly significant ($P < 0.01$) for all udder traits measured.

Table 1: Mean Squares of Udder Traits due to the Effect of Udder Shape of Red Sokoto and West African Dwarf Goats

Udder traits	Means Square	
	Red Sokoto	West African Dwarf
Udder Length (UL)	32.17***	77.81***
Udder width (UW)	25.06***	66.34***
Udder circumference (UC)	220.58***	563.91***
Distance between teats (DT)	14.86***	57.83***

***P<0.001

Least-squares means for the effect of udder shape on UL, UW, UC and DT for RS goats are presented in Table 2. Four types of udder identified in Red Sokoto-goats were funnel, round, cylindrical and bowl. Udder length differed significantly

(P<0.01) with udder shape; as bowl shaped udders proved most superior. However, apparent differences between round and funnel udders were not significant (P>0.05).

Table 2: Least Square Means (\pm SE) for the Effect of Udder Shape (US) on UL, UW, UC, and DT of Red Sokoto Goats.

Least squares means					
Udder shape	N	UL(cm)	UW(cm)	UC(cm)	T(cm)
Funnel	13	12.06 \pm 0.66 ^c	8.24 \pm 0.66 ^c	22.83 \pm 1.08 ^c	6.58 \pm 0.44 ^c
Round	2	12.01 \pm 1.54 ^c	8.29 \pm 1.35 ^c	24.64 \pm 2.54 ^b	6.55 \pm 1.04 ^c
Cylindrical	55	12.94 \pm 0.33 ^b	8.73 \pm 0.46 ^b	24.39 \pm 0.55 ^b	7.23 \pm 0.22 ^b
Bowl	60	14.52 \pm 0.31 ^a	10.23 \pm 0.45 ^a	28.87 \pm 0.52 ^a	8.28 \pm 0.21 ^a

^{a,b,c}, Means in the same column followed by different superscripts differ significantly (P<0.01).

UL = Udder length
 UW = Udder width
 UC = Udder circumference
 DT = Distance between teats

Udder width showed similar pattern with UL; bowl udders had the largest UW while round and funnel udders had the smallest. Cylindrical udder falls in between. Udder circumference was significantly larger for bowl udders (28.87 \pm 0.52cm) than for all other shapes. While funnel udder had the smallest value (22.83 \pm 1.08cm) for UC, there was no significant difference between that of cylindrical and round

udders. Distance between teats was widest for bowl udder, whereas round and funnel udders exhibited equal DT.

The superiority of bowl udder over other types of udder observed in this study did not agree with the report of Montaldo and Martinex-Lozano (4) who categorized udders as globular and non globular, and reported that globular udders were superior to non-globular ones. It

however, compared with the report of Prajapati *et al.*, (5). If bowl shaped udders in Red Sokoto goats have more secretory tissues than other types of udder it could be a pointer to greater potential

for milk production.

Least squares means (\pm SE) for the effect of udder shape on UL, UW, UC and DT for West African Dwarf goats are shown in Table 3.

Table 3: Least Squares Means (\pm SE) for the Effect of Udder Shape on UL, UW, UC and DT in West African Dwarf Goats

Uddershape	N	UL(cm)	UW(cm)	UC(cm)	DT(cm)
Funnel	1	11.30 \pm 1.87 ^b	6.71 \pm 1.44 ^c	16.26 \pm 3.65 ^c	5.64 \pm 1.17 ^c
Cylindrical	90	10.78 \pm 0.90 ^c	8.14 \pm 0.22 ^b	22.18 \pm 1.35 ^b	7.20 \pm 0.18 ^b
Bowl	94	13.30 \pm 0.89 ^a	10.43 \pm 0.18 ^a	28.80 \pm 1.31 ^a	9.34 \pm 0.14 ^a

^{abc}, Means in the same column followed by different superscripts differ significantly ($P < 0.01$).

UL = Udder length

UW = Udder width

UC = Udder circumference

DT = Distance between teats

Three types of udder namely funnel, cylindrical and bowl were discovered in WAD goats. Bowl shaped udder was superior in size to other types of udder for all traits. While cylindrical udder was smallest for UL, funnel udder consistently exhibited smallest value for UW, UC and DT. Variation observed between udder shape for all the traits measured were significant ($P > 0.01$).

The superiority of bowl udder size over those of other types supports the observation of Prajapati *et al.* (5). It also agrees with the report of (6) on Holstein Friesian cows where bowl shaped udder had well developed quarters and well placed teats.

The large variation in the sizes of different types of udder observed for both RS and WAD goats in this study suggested that these indigenous goat breeds have not been selected for udder shape. There is therefore an opportunity for improving udder characteristics to enhance milk production.

Conclusion and Applications

In conclusion, bowl shaped udder recorded largest udder dimensions, in both RS and WAD

goats. The significant variations observed in the sizes of various udder types suggested that these Nigerian goat breeds have not been selected for udder shape. This study has opened up an avenue for further research towards appraising any genetic relationship between udder shape and milk production.

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