

Relationship among some Intrinsic Milk Related Traits in Extensively-Managed West African Dwarf Does

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Abstract: Scrutiny of milk production traits is a necessity towards identifying dairy potentiality of West African Dwarf does. Mammary gland morphometric characteristic of lactating extensively managed West African Dwarf (WAD) does (n = 330) was examined based on age, lactation length (LL) and kids' number. Udder traits (length-UL; width- UW and circumference - UC) and teat traits (Length –TL; diameter- TD and distance between teats -DBT) were examined. Data obtained were subjected to Pearson correlation. The result revealed a nonsignificant influence of kids' number on all the traits while a significant ($P < 0.05$) but negative correlation coefficient (-0.198) was observed between UC and LL. A strong association was obtained among all the udder traits (UC, UL, UW) and between DBT and udder traits (UC: $r = 0.544$; UL: $r = 0.667$; UW: $r = 0.588$). This study concluded that age and lactation length of lactating WAD does had minimal influence on teat and udder characteristics but a selection priority for UL has greater tendency to accompany increase in other mammary gland parts.

Keywords: Lactation, Morphology, Relationship, Teat, Udder

Description of Problem

A conglomerate of factors is known to influence the quality and quantity of milk obtainable from livestock. Genetic make-up, for instance, has been reported among the factors that affect the milk yield and composition in various ruminant species (1; 2). Similarly, a positive correlation was indicated to exist between lactation yield and some of the udder morphometric characteristics of ruminant species (3; 4). Therefore, identification of potential dairy animals are usually based on actual yield test and some physical characteristics which are considered to be indicative of yield ability (5). Udder and teat physiological and conformational characteristics are vital to lactation, and are often considered in addition to other factors when dairy animals are selected. Shape and size of the udder and teat, for instance, have been shown to be related to milk yield of some species of ruminants (6). Ease of milking was also documented (7) to have strong association with the morphology of the mammary gland and its attachments. Therefore, morphometric characteristics of the physiological apparatus for milk production and ejection is one the most important considerable factors if WAD goats are to be selected for dairy purpose. There is however a dearth of information on these dairy production traits in WAD goats. Thus, the present study was aimed at examining the influence of doe age, lactation length and kids' number on udder and teat morphology of semi-intensively managed lactating West African Dwarf does. This would eventually assist in designing selection criteria for potential dairy candidates in WAD goats.

Materials and Methods

Experimental Sites: The study was conducted in the agrarian communities in Ilorin south and Ilorin East Local Government Areas, Kwara State Nigeria. This comprised of Aleniboro, Sentu, Ile-Apa, Oke-ose and Lajiki.

Experimental Animals: Three hundred and thirty extensively managed lactating West African Dwarf does within the age range of 1 – 10 years were used for the study. The goats were grouped into five age ranges (1 – 2yrs; 2 - 4yrs; 4 - 6yrs; 6 - 8yrs; 8 - 10yrs) using dentition (8) and production history obtained from the owners of the animals.

Data Collection: Flexible tape rule was used for measuring udder and teat morphometric parameters as described by (9). The parameters measured were: Udder width (UW) - distance between the widest part of the udder measured from the rear end; Udder length (UL) - length from rear to the front attachment of udder along with its sole, where the udder blends smoothly with the body; Udder circumference (UC) – this was measured

at maximum diameter of udder; Teat length (TL) – distance from attachment of teat with udder to the end of teats; Right and left Teat diameter (TD) – distance between the middle of teats and its side and; Distance between teats (DBT) - distance between sphincters of the right and left teats.

Data analysis: Relationship between the variable was analyzed using Pearson's correlation of SPSS Version 17.

RESULTS AND DISCUSSION

Pearson's correlation coefficients among the milk related specific factors (Age of the does, lactation length and litter size) and morphology of udder and teat in lactating WAD does are presented in Table 1. Age of the dam has no significant ($P > 0.05$) correlation with all the udder morphometric measurements (length, width and circumference) of the examined WAD does. There was a significantly ($P < 0.05$) positive relationship between the age of the does and the length of the teats on both left and right positions. The length of the left teat (LTL) had a highly significant ($P < 0.01$) correlation with the age of the does when compared to the right teat (RTL). A negative correlation coefficient (-0.198) was however observed between the lactation length (LL) and udder circumference (UC). The number of kids suckling the does had no relationship with all the udder and teat measurements. The udder width (UW) of the goats had highly significant and positive relationship with udder length (UL: 0.438), udder circumference (UC: 0.872) and distance between teats (DBL: 0.588). The RTL had a significant relationship with udder width. Udder length had a highly significant relationship ($P < 0.01$) with udder circumference and were also highly correlated ($P < 0.01$) with distance between teats (DBT). RTL and LTL were both significantly correlated with UL (RTL: 0.184; LTL: 0.187) while only RTL had a highly positive correlation coefficient (0.225) with UC. The relationship between RTL and LTL as well as RTD and LTD were observed to be positive and highly correlated, while LTL was negatively correlated with both RTD and LTD. A significantly negative correlation coefficient (-0.185) was also observed between LTD and DBT.

Non-significant association observed between the age of the goats and udder measurements was also reported for Black and Meriz goats by (1), while the positive correlation coefficient between teat length and age of the goats contradicts their findings. This result suggests that as the animal ages the teat length increases. The negative relationship between the udder circumference and length of lactation is suggestive of gradual involution of mammary gland as lactation declines (10). Involution is likely induced when the kids suckling the mammary glands are becoming independent of dams' care. This result could also be associated with possible inhibition of galactopoietic hormones as a result physiological adjustment during pregnancy (11) which was inevitable among the animals used for the study because of their management system. A generally strong interrelationship among all the udder related measurements negates the findings of (4) who observed a different trend between the traits except for width and circumference of the udder.

Table 1: Correlation matrix among milk related specific factors and morphology of udder and teat

	AGE	LL	LS	UW	UL	UC	RTL	LTL	RTD	LTD
UW	-0.058; 0.507	-0.121; 0.166	0.088; 0.318	-				-		
UL	0.046; 0.602	0.010; 0.912	0.075; 0.390	0.438**; 0.000	-					
UC	0.133; 0.129	- 0.198*; 0.023	-0.011; 0.900	0.872**; 0.000	0.364**; 0.000	-				
RTL	0.283*; 0.006	-0.009; 0.915	-0.048; 0.581	0.192*; 0.027	0.184*; 0.035	0.225** ; 0.010	-			
LTL	0.283** ; 0.001	0.004; 0.963	-0.026; 0.763	0.092; 0.295	0.187*; 0.031	0.148; 0.091	0.793** ; 0.000	-		
RTD	-0.097; 0.271	-0.026; 0.768	-0.029; 0.740	-0.019; 0.829	0.014; 0.873	-0.026; 0.767	-0.113; 0.198	-0.215*; 0.013		
LTD	-0.091; 0.298	-0.066; 0.454	-0.040; 0.645	-0.076; 0.386	0.084; 0.338	-0.093; 0.287	-0.060; 0.492	-0.186*; 0.032	0.852**; 0.000	

DBT	-0.028;	0.102;	0.000;	0.588**;	0.667**;	0.544**	0.103;	0.084;	-0.092;	-0.185*;
	0.001	0.243	0.996	0.000	0.000	; 0.000	0.240	0.337	0.293	0.033

* indicates that correlation coefficient is significant at 0.05 level (2 tailed - 5%); ** indicates that correlation coefficient is highly significant at 0.001 level (2 tailed - 1%);

The strong association between the diameter as well as length of the right teat and their corresponding left teat measurements is an indication that the two teats are frequently being suckled and that the prevalence of weak teat which is a major defect in dairy (12) is not a popular attribute among WAD goats. None of the udder attachment (teats) is weak among the experimented goats. Differences in the level of aggressiveness of the offspring during suckling could result into differences in the size and shape of the teats. The negative association recorded between the diameter and the length of the teat suggests that the longer the teat the less the diameter. A relatively strong association between distance between the teats and each of the udder related measurements (UC, UD and UW) of the goats conforms to the findings of (4). The report by (13) also indicated a significant correlation coefficient between udder length and teat size in one of the breeds that were investigated which corroborates the current finding. This association depicts that the more superior the width, length or circumference of the udder the farther apart the teats or attachments.

Conclusion and Application

Few of the udder and teat characteristics of lactating WAD does are minimally influenced by the length of lactation and age of the does rather than number of suckling kids. It is concluded that selection for udder length would not only accompany increase in other udder traits but also a number of other teat characteristics that are required for efficient milking.

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