academicJournals

Vol. 8(25), pp. 3255-3258, 4 July, 2013
DOI: 10.5897/AJAR2013.7132
ISSN 1991-637X ©2013 Academic Journals
http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Assessment of udder characteristics of West African Dwarf (WAD) goats reared under different management systems in Makurdi, Benue State, Nigeria

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Accepted 24 June, 2013

A study was carried out to assess udder characteristics of 114 West African Dwarf (WAD) goats reared under extensive and semi-intensive systems of management. Udder width (UW), udder circumference (UC), udder length (UL), distance between teats (DBT), right teat diameter (RTD), left teat diameter (LTD), right teat length (RTL) and left teat length (LTL) were measured. The animals were classified into two groups comprising animals below the age of two years and above two years of age respectively. Statistical analysis of the data collected showed a significant difference (P < 0.05) in UC of goats reared under the two systems. The means of 22.60 ± 0.78 and 22.69 ± 0.82, 18.82 ± 1.45 and 18.73 ± 1.48 for right and left halves of the udder were recorded for goats reared under the semi intensive and extensive management systems respectively. Goats that were aged two years and above had mean values of 25.44 ± 0.58 and 25.28 ± 0.54 under the semi intensive system for the right and left halves respectively, while extensive system had 23.09 ± 0.68 and 23.20 ± 0.61 for the right and left halves respectively. No significant difference (P > 0.05) was observed between the two management systems for the rest of the udder characteristics that were studied in the two groups of goats.

Key words: Udder characteristics, management system, reproduction, goat.

INTRODUCTION

Goat production plays a very vital role in the livelihood of rural populations in Nigeria as sales of the animals and their products help to stabilize household income. The tropical environment, with its characteristic harsh weather conditions, adversely affect meat and dairy performance of animals (El-Hassan et al., 2009). It has been reported that goat milk is a preferred substitute for persons who suffer from allergies to cow milk or other food sources (Van der Horst, 1976), hence more people drink goat milk in preference to milk from other species (Park and Chukwu, 1989). In many developing countries, there is a growing awareness of using goats as the most efficient animals for milk production.

The udder is a very important gland in reproducing animals and for milk production. Several studies have confirmed that udder and teat characteristics are important determinants of milk yield and ease of milking or milking ability in dairy animals (Akpa et al., 2002; *De la* Fuente et al., 1999; Rogers and Spencer, 1991). Udder and teat characteristics have been shown to be

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influenced by several factors such as genotype, breeding and management systems (Milerski et al., 2006). In a study conducted in South Western Nigeria, Amao et al. (2003) showed that age, lactation status and live weight are the major factors that influence udder traits in West African Dwarf goats. The study of udder morphology and physiology should be of special interest for rearing ability, dairy potentials and diversification of some breeds considered for meat purpose. There is lack of wealth of information on udder and teat characteristics of meat breeds of goats. The present study was designed to evaluate the influence of management system on the udder and teat characteristics of the West African Dwarf (WAD) goats.

MATERIALS AND METHODS

Experimental site

The study covered all the districts within Makurdi municipal, the Headquarters of Benue state, Nigeria. Makurdi is located in the savanna zone, north central Nigeria with monthly minimum and maximum temperatures of 22.1 and 32.2°C. It is located within latitude 7°43'50''N and longitude 8°32'10'' E. The altitude is about 104 m above sea level.

Experimental animals

Animals used for this study were female WAD goats reared under extensive and semi-intensive systems of management. A total of 114 goats were sampled between December 2011 and January 2012 in various districts of Makurdi metropolis.

Measurement of udder characteristics

The animals were adequately restrained in a standing or recumbent position depending on the parameter to be taken. The external udder measurements were measured as described by Papachristoforou and Mavrogenis (1981). These measurements included udder length (UL) from attachment to middle of udder, and udder circumference (UC) above teats measured with a flexible tape. Right and left teat lengths (TL) were measured from attachment of teat with udder to the end of teats. By using a calliper, teat diameter (TD) was taken in the middle of teats, udder width (UW) above teats at rear of udder and distance between teats (DBT) was between the two teats attachment with udder. Cistern height (CH) was taken as the distance from the base of the teat to a point midway before the attachment of the udder to the abdominal wall, also the teat angle (TA) which was measured with a protractor by placing it on the udder with the midline of the protractor in line with the linea alba which divides the mammary gland into two. An imaginary line was then observed and traced with a broom stick from the teat downwards to the linea alba and this was recorded as the teat angle, and teat floor distance (TFD) was taken using a ruler as the distance between the tip of the teat and the ground.

Statistical analysis

The data were analyzed using Graph Pad In stat where the student T-test was used to compare means of different parameters between the two age groups.

RESULTS AND DISCUSSION

The udder traits (mean ± SEM) measured for female WAD goats under the age of two and two or more years reared under both extensive and semi intensive management systems are presented in Tables 1 and 2 respectively. The results showed that, both the extensive and semi intensive systems had no significant influence on the TD, TL, UW, DBT, TA, and CH. Also there was no significant difference between the right and left udder and teat in terms of DBT, TA, CH, UW, TFD. However, the UC was found to significantly ($P < 0.05$) vary between extensive and semi intensive systems (Tables 1 and 2).

Animals that store a large proportion of milk in the gland cistern produce more milk and are more able to tolerate extended milking intervals. Udder size has a strong and significant effect on milk yield (Mavrogenis et al., 1988) which makes it an important factor in the machine milkability of dairy breeds (Fernandez et al., 1995).

The udder circumference, width and height have been identified as traits which could replace the udder volume measurement because they are easy to measure and have high repeatabilities (Martinez et al., 2011). The no significant difference observed between the right and left udder and teat in respect of DBT, TA, CH, UW, TFD indicate that these parameters were not affected by the management factor.

The values for the right and left udder circumferences (UC) of WAD goats aged less than two years were 22.60 ± 0.78 and 22.69 ± 0.82 for the semi intensive system (Table 1). On the other hand, under the extensive system the values recorded were 18.82 ± 1.45 and 18.73 ± 1.48 for right and left udders respectively. Similarly, the values for WAD goats aged two years and above were 25.44 ± 0.58 and 25.28 ± 0.54 under the semi-intensive and 23.09 ± 0.68 and 23.20 ± 0.61 under the extensive management systems (Table 2). These results agree with earlier studies by Fernandez et al. (1995) and with the findings of Amao et al. (2003) for non-lactating West African dwarf do. Amao et al. (2003) showed that lactation status significantly influenced the udder circumference. However, in the present study, the differences observed might be as a result of feed supplementation associated with goats reared under the semi intensive system of management (Anurudu et al., 2004). These results may confirm that the udder circumference is a trait of interest in lactation studies. It will be worthwhile to carry out more baseline studies on the udder and teat traits of indigenous breeds of goats with the aim of establishing selection markers for milk improvement.

ACKNOWLEDGMENT

The authors wish to acknowledge the Administration of the College of Veterinary Medicine, University of

Table 1. Udder characteristics of WAD goats below two years of age (Mean ± SEM).

Trait		Management	
		Semi intensive	Extensive
Teat length (cm)	R	1.95 ± 0.09	2.00±0.10
	L	2.00 ± 0.10	2.04 ± 0.10
Teat diameter (cm)	R	0.78 ± 0.03	0.74 ± 0.05
	L	0.78 ± 0.03	0.76 ± 0.05
Teat angle (°)	R	39.29 ± 1.59	40.85 ± 1.20
	L	40.86 ± 1.99	40.77 ± 1.93
Distance between teats (cm)		7.33 ± 0.26	6.72 ± 0.38
Teat floor distance (cm)	R	21.24 ± 0.94	22.36 ± 1.08
	L	21.48 ± 0.92	22.79 ± 1.14
Cistern height (cm)	R	2.90 ± 1.08	2.55 ± 0.30
	L	2.89 ± 0.19	2.71 ± 0.28
Udder depth (cm)	R	5.89 ± 0.36	5.74 ± 0.48
	L	5.78 ± 0.26	5.70 ± 0.37
Udder width (cm)	R	10.32 ± 0.61	8.61 ± 0.63
	L	10.26 ± 0.45	8.86 ± 0.67
Udder circumference (cm)	R	22.60 ± 0.78^{b}	18.82 ± 1.45^{c}
	L	22.69 ± 0.82^{b}	18.73 ± 1.48^{c}

Means with different superscripts in a row are significantly different (P < 0.05).

Table 2. Udder characteristics of WAD goats two or more years of age (Mean ± SEM).

Traits		Management Systems	
		Semi intensive	Extensive
Teat length (cm)	R	2.40 ± 0.11	2.40 ± 0.07
	L	2.34 ± 0.06	2.43 ± 0.06
Teat diameter (cm)	R	0.97 ± 0.03	0.94 ± 0.03
	L	0.97 ± 0.03	0.95 ± 0.03
Teat angle (º)	R	40.31 ± 1.97	41.22 ± 1.46
	L	41.95 ± 1.39	40.36 ± 1.51
Distance between teat (cm)		8.24 ± 0.26	7.83 ± 0.23
Teat floor distance (cm)	R	18.95 ± 0.64	20.43 ± 0.75
	L	18.80 ± 0.65	20.42 ± 0.70
Cistern height (cm)	R	3.76 ± 0.16	3.42 ± 0.16
	L	3.95 ± 0.17	3.49 ± 0.15
Udder depth (cm)	R	7.44 ± 0.26	7.35 ± 0.28
	L	7.44 ± 0.27	7.25 ± 0.29
Udder width (cm)	R	12.00 ± 0.34	11.48 ± 0.33
	L	11.96 ± 0.37	11.38 ± 0.31
Udder circumference (cm)	R	25.44 ± 0.58^{b}	23.09 ± 0.68^{c}
	L	25.28 ± 0.54^{b}	23.20 ± 0.61^{c}

Means with different superscripts in a row are significantly different (P < 0.05).

Agriculture, Makurdi, for assigning a final year student for this study.

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