PAT June, 2018; 14 (1): 1-6 ISSN: 0794-5213
Online copy available at www.patnsukjournal.net/currentissue
Publication of Nasarawa State University, Keffi

EFFECT OF UDDER SIZE AND ITS RELATIONSHIP WITH MILK YIELD IN TWO BREED OF GOATS (WAD AND WB) IN SOUTHERN NIGERIA

Akpohuarho P.O and Udeh I.
Department of Animal Science,
Delta State University, Asaba Campus, Asaba Nigeria
E-mail okpakophilip@gmail.com

Abstract
The study investigated the relationship among milk yield and udder size of White Bornu (WD) and West African Dwarf (WAD) goats reared in Southern Nigeria using ten lactating doe per breed. Data on milk yield were recorded daily for the first 25 days lactation. Udder traits measurement include udder length (UL), udder width (UW), udder circumference (UC), teeth length (TL), teeth Width (TW), teat circumference (TC), teeth height from gland (THG) and distance between teeth (DBT). The result indicate that White Bornu (WB) had significant (P<0.05) higher milk yield (328.60g) while West Africa Dwarf (WAD) had the least milk yield 261.62g. White Bornu Udder traits also had the higher value when compared to West Africa Dwarf goats except udder width where there is no significant (P>0.05) breed difference. Results of the correlation coefficients between milk yield and udder traits where mostly positive and non-significant (P > 0.05) in the two breeds of goats and ranged from -0.087 to 0.478 in WAD and -0.054 to 0.299 in WB. Positive and significant (P < 0.05, 0.01) relationship was obtained among some of the udder traits in the two breed of goats. It may be concluded that, the udder traits measured could not accurately predict the milk yield of WAD and WB lactating goats.
Keywords: *Effect, Udder size, Relationship, Milk yield, Breed, Goats*

Introduction

Small ruminant are important genetic resources not only for Nigeria but for all of Africa. Africa has a population of 205 million sheep and 174 million goats, representing approximately 17% and 31% of the world total respectively (FAO, 1990). In Nigeria, the indigenous goats belong to three distinct breeds. The long-legged Sahel found in the arid and Sahel regions. The relatively bigger body white Bornu (WB) found in the Savannah zone and the hardy, the short-legged West African Dwarf (WAD) restricted to high humid forest of the south (Adu *et al.*, 2000). Virtually, all these breeds are found in Delta State, the study area. The West African dwarf (WAD) goats had the highest concentration followed by the white Borun (WB) goats and Sahel had the least population (Zahraddeen *et al.*, 2007). The population of West African dwarf increases from the drier to wetter parts, conversely, the white Borun goat population increases as one moves toward the derived Savannah zone of the state. However, the distribution of goats in the country is not uniform. A report shows that more than 60% of goat population is found in the Sudan savannah (Adalemo and Baba, 1993). Similarly, a survey in Kaduna state showed that over 90% of traditional households keep goat or sheep (Otchere *et al.*, 1987).

Goat can play a very important role in increasing the low level of animal protein production and supply in many developing countries. Processed foods, such as livestock products, vegetables and high value cereals, tend to gain high demand in the Urban Centre in the worlds, (Beever *et al* 2001). To meet this demand, Agricultural production most increases and become more market oriented to supply urban area. Globally, goat production yields 60% of its value as milk, 35% as meat and 5% as skin (Malau-Aduli *et al.*, 2001). The world goat population was estimated to be 706 million with more than 90% from developing countries. Out of this, Nigeria has over 28 million representing 4% of the current world production (FAO, 2006).

However, for goats to give maximum contribution to animal protein production and supply in the developing world, their reproductive efficiency most be evaluated and improved upon. The low reproductive performance of goats in the country has been linked to factors such as breed

(Ahamefule *et al*, 2005, Zahraddeen, 2006) nutrition (Malau-Aduli *et al,* 2004) season Bustwat *et al*, 2005), age (Akpa, 1998) pest and disease (Adegbola, 2002). It has been reported that the low level of literacy among farmers is also responsible for the low reproductive performance of these animals (Odeyinka and Okunade, 2005).

Superiority in reproductive performance is generally seen as a valuable trait in animal production. The superiority may be as a result of differences in genetic make-up or due to high adaptability to prevailing climates or as a result of difference as in management practices generally employed in rearing animals, therefore superior breeds that have been fully adapted to the prevailing weather conditions can be fully exploited in breeding programs. However, correlating reproductive traits in goats and in other species of livestock can be used as a viable tool to increase the magnitude of these traits. For instance, negative correlation between two traits suggests that while there is an increase in the parameter in one breed the other remains low or when there is positive correlation, it implies that an increase in one trait also leads to increase in the other trait. By using this tool, the easily measured traits can be used as predictors of the less easily measured ones. Therefore, the breed that has potentials for use in breeding programs can be well utilized since reproductive traits can be viable indices for selection of breeding animals. Assessment of the genetic correlations between milk yield on udder size of two Nigerian goats is comparatively scanty available in literature. Therefore this recent studies is aimed at improving the productivity of the Nigeria local goats.

Methods

The study was conducted at the Goat Research unit of the Department of Animal Science, Faculty of Agriculture, Delta State University, Asaba Campus. Delta State falls within the humid tropic of Nigeria and Asaba precisely lies between longitudes 6^{O}E and 8^{O}E, and Latitude 06^{O}49" North of the Equator. Asaba has its rainy season from March, with a mean annual rain fall of 1500 – 1849.3mm. It has a moderate climate with very high temperature during the dry season with it mean annual temperature and precipitation of 28^{0}C ± 6 ^{0}C and 1117mm; respectively.

The breeding animals were purchased direct from the open market in Asaba cattle market. Selection at this stage was by visual appraisal. Only animals that were structurally sound, free from obvious physical and hereditary defects and appeared healthy were purchased. Initial herd of 20 pregnant does of West African Dwarf (WAD) and White Bornu (WB) goat was purchased and transported to the experimental site. All the routine management practices such as inoculation, prophylactic application of certain drugs and chemicals to prevent incident of disease as well as curative measures were applied as and when necessary. The goats were maintained on forage with a supplementary concentrate ration. Occasionally, they were sent out to graze around the goat unit containing grass species and browse plants *Andropagon gayanus, cynadon nemfluenesis and panicum maximum as grassed, legumes centrosema pubescen, impomea batata and Arachis hypogea and others. Manihot spets concentrates* crushed maize, soyabeans, bambara nuts, salts, and ground nut cake.

Data Collection and Analysis

Data were collected, on the following parameters. Udder length (UL), udder width (UW), udder circumference (UC), distance between teat (DBT), teat height from the ground (THG) Teat length (TL), Teat width (TW) and Teat Circumference (TC) using a flexible canvas tape.

All measurement was done in the morning every day before the animals were turned out to pasture and milked. Frequency of data collection was on daily basis for 25 days, for one lactation. Udder volume (UV) was derived by using the formula $UV = 4/3\ \pi r^3$ were e = 22/7. r = (UL + UW)/4 as described by Amao (1999). Following parturition, does were milked on daily basis for 30 days. Does in particular are temperamental and may refuse to let down milk

if separated from their kids as such the kids were introduced twice a day (9am & 5pm) to suckle the dam in order to stimulate milk let down. As soon as the milk start letting down the kids were removed and replaced by manually milking the dam milk into a clean measuring cylinder. Good sanitary measure was observed while milking. The milk collected after measurement were offered to the kids using a plastic feeding bottle, the milk obtained was defined as the partial daily milk yield (PDM). The PDM (in ML or g) was determined by a calibrated measuring cylinder and electronic weighing scale.

The data generated were summarized using descriptive statistics such as mean, standard error, minimum and maximum. The Correlation Coefficients among partial milk yield and Udder traits were compared and the two breeds of goats compared in each trait using student t test. The analysis of the data was performed using SPSS (2007) statistical package.

Results and Discussion

The means values obtained for milk yield and udder measurements of the goats are shown in Table 1. The results showed white Bornu (WB) had significantly (P<0.05) higher milk yield (328.60g) compared to West African Dwarf goat (261.62±0.64g). Similarly, WB had significantly (P <0.05) high value for udder traits compared to WAD with the exception of udder width. Also the difference in increase in measurement was also in favour of White Bornu (WB) goat as shown in the table 1. However, the percentage increase in the measurement favoured West Africa Dwarf (WAD) goats, thus suggesting that if the size of WAD could be increased there would be higher milk yield since the measurement has direct relationship with milk yield.

The result of Udder measurements revealed significant (P<0.05) breed differences, for all the parameters measured with WB having higher values except for udder width where breed had no effect. Udder volume of 54.21g and 20.96g were obtained for WB and WAD goats respectively. West Africa Dwarf (WAD) goats had the smallest dimensions in all parameters considered. This finding agrees with the observation of Akpa *et al* (1998) and Akpa, (2002) who reported significant influence of breed on udder size of Red Sokoto (RES) and West Africa Dwarf (WAD goats.

The coefficients of correlation among milk yield and udder measurements in WAD (lower matrix) and WB (upper matrix) are shown in Table 2. Results indicate that milk yield was positively related to udder traits in both breeds of goats, with the exemption of YLD and THG (-0.087), YLD and DBT (-0.149) in WAD and YLD and UDC (-0.054), YLD and THG (-0.246) in WB. The positive correlation between milk yield and Udder traits in this studies presuppose that growth in this Udder dimension will invariably result to increase in milk yield, and the negative correlation between the YLD and DBT (-0.149) in WAD and YLD and UDC (-0.054), and YLD and THG (-0.246) in WB implying a decrease in milk yield as the Udder dimension increased. This agrees with the work of Philips (1992) who reported similar relationship between two parameters in African Giant Snail.

However, the correlation coefficients between milk yield and udder traits were not significant (P>0.05) in both breed of goats, thus implies that the udder traits measured could not accurately predict milk yield in both breeds of goats. The correlation coefficients among udder traits were mostly positive and significant (P<0.05, 0.01) in some cases in both breeds of goats. For example, in WAD goats, the correlation between UDL and UDW (0.718), UDC (0.722), TTL and DBT (0.608) and TTW and TTC (0.800) were highly significant (P<0.01). In WB, highly significant (P<0.05) correlation were obtained between UDL and UDW (0.885), UDW and UDC (0.790), TTW and TTC (0.777), TTW and TTC (0.795), TTC and THG (0.622), and TTC and DBT (0.634). This implies very high predictability among the udder traits of the two breeds of goats. This finding is in consonance with the observation of Dijkstra *et al*(1997) and Das

and Sidhu (1975) in which Udder Circumference, length, width, and depth were significantly (P<0.1)correlated (r =0.465-0.866)with milk yield in Barbari and black Bengal goats in India.

Table 1: Mean value of Milk yield and udder measurements of experimental Animals

Variables	Breeds							
	WB			% Increase	WAD			% Increase
	$\bar{X} \pm S.\bar{E}$	Min	Max		$\bar{X} \pm S.\bar{E}$	Min	Max	
YLD (g)	328.60 ± 0.64^{a}	312	343	9.9	261.62 ± 0.64^{b}	250	275	10.0
UDL (cm)	4.39 ± 0.03^{a}	3.60	5.30	47.2	2.64 ± 0.03^{b}	2.10	3.10	50.0
UDW (cm)	5.00 ± 0.04^{a}	3.10	5.30	70.96	4.20 ± 0.04^{a}	3.60	5.70	58.3
UDC (cm)	10.37 ± 0.16^{a}	6.00	13.20	120	9.13 ± 0.16^{b}	1.50	10.40	593.3
TTL (cm)	2.22 ± 0.05^{a}	1.40	3.20	128.6	1.36 ± 0.5^{b}	0.60	2.90	383.3
TTW (cm)	1.31 ± 0.03^{a}	0.70	1.80	157.1	1.07 ± 0.3^{b}	0.30	1.70	466.7
TTC (cm)	2.34 ± 0.04^{a}	1.10	3.60	227.3	1.67 ± 0.4^{b}	1.00	2.40	140
THG (cm)	10.47 ± 0.08^{a}	9.10	13.00	42.9	0.63 ± 0.08^{b}	5.60	7.30	30.4
DBT (cm)	3.47 ± 0.04^{a}	3.00	4.00	33.31	2.58 ± 0.04^{b}	1.90	3.90	105.3
UV (g)	54.21				20.59			

Means in the same row with different superscript are significantly different (P < 0.05)
Key *YLD = Yield = UDL, Udder Length, UDW = Udder Width, UDC = Udder Circumference TTL teat Length, TTW = teat width, TTC, teat circumference THG teat height from ground, DBT distance between teat*

Table 2: correlation coefficient among udder measurements and milk yield of WAD Goats (lower matrix) and WB Goats (upper matrix)

	YLD	UDL	UDW	UDC	TTL	TTW	TTC	THG	DBT
YLD	-	0283	0.106	-0.054	0.161	0.299	0.266	-0.246	0.119
UDL	0.318	-	0.885**	0.735	0.378	0.185	0.095	0.435	0.563*
UDW	0.025	0.718**	-	0.790**	0.419	0.149	0.174	0.574*	0.449
UDC	0.478	0.722**	0.396	-	0.486	0.258	0.190	0.403	0.261
TTL	0.018	0.288	0.497	0.271	-	0.558	0.777**	0.543*	0.362
TTW	0.332	0.371	0.435	0.325	0.400	-	0.795**	-0.339	0.604
TTC	0.229	0.506	0.463	0.463	0.518*	0.800**	-	0.622**	0.634**
THG	-0.087	0.121	0.053	0.295	0.118	-0.291	0.380	-	0.136
DBT	-0.149	0.244	0.529*	0.113	0.608**	0.345	0.447	0.174	-

Key: YLD = Yield, UDL = Udder Length, UDW = Udder Width, UDC = Udder Circumference, TTL = Teat Length, TTW =Teat Width, TTC = Teat Circumference, THG = Teat Height from ground, DBT = Distance between Teat. * P < 0.05, ** P < 0.01

Conclusion and Recommendation

The size of udder and teats during lactation could be significant determinant of average potential daily milk yield per lactation. Genetic correlation between udder traits and partial daily milk yield should be carried out in further research to determine their relevance to milk production in the two breed. Dairy goat farmer could use udder size of goats to predetermine its milk production potential.

References

Adegbola, T.A. (2002). Nutrient intake, digestibility and rumen metabolites in bulls feed rice straws with or without supplements. Nigerian Journal of Animal Production 29(1): 40 – 46.

Adelemo, I.A. and Baba, J.M. (1993). Nigeria Giant in the tropics, 1:129, Gabumo Publishing Co. Limited, Lagos, Nigeria. Pp 71 – 85.

Aderson, R.R. Harness, J.R. Snead, A.F. and Salah, M.S. (1981). Mammary growth pattern in goats during pregnancy and lactation. J. Dairy Sci. 64: 427 – 432.

Adu, I.F., Buvanendran Y. and Lakpini, C.A.M. (2000). The reproductive performance of Red Sokoto Goats in Nigeria. Journal of Agricultural Sciences (Camb), 93:563-566.

Agbede, J.O. Ologun, A.G. and Alakan, J.A (1997), Udder size and milk production potentials of goats and sheep's in south-west Nigeria. Nig. J. Anim. Prod. 24 (2): 175 – 179.

Ahamefule, F.O., Ibeawuchi, J.A. and Ibe, S.N. (2005). Performance of West Africa Dwarf (WAD) Bucks Fed Pegeon Pea-Cassava peel Base diets. Journal of Animal and veterinary Advances 4 (12): 10.

Akpa G.N. Duru. S, Dim, N.I. Alawa J.P. and Jokthan, G.E. (1998). Sources of variations in uder traits of Red Sokoto goats. In Oduguwa, O.O., Fanimo, A.O. and Osinowo. O.A. (Eds). Animal Agriculture in Wets Africa: The sustainability question. Proc. of the Silver Anniversary Conf. of the Mig. Soc. For Anim. Prod. And the inaugural conf. of the West African Soc. for Anim. prod. (WASAP) held at Gateway, Hotel Abeoakuta Nigeria, 21 – 26th March, 1998. p 650

Akpa, G.N. Asirobo, O.W. Oni O.O., Alawa, J.P, Dim N.I, Osinowd O.A, and Abubakar B.Y. (2002). Milk Production by Agropastoral Red Sokoto Goats in Nigeria. Tropical Animal Health and production.

Akpa, G.N., Duru, S., Dim, N.I., Alawa, J.P. and Jokthan, G.E. (1998). Sources of variation in udder traits of Red Sokoto goats. Proceedings of Silver Anniversary conference of Nigerian Society of Animal production. Abeokuta, Nigeria, March 21 – 26.

Amao, O. A. Evaluation of udder in West African Dwarf and Red Sokoto goats. M. Agric. Thesis Department of Animal production and Health, University of Agriculture, Abeokuta, Nigeria.

Beever, D.E. and Mould, F.L. (2000) Forage evaluation for efficient Ruminants Livestock production. In: D.I. Givens, D.I. Owens, E. Axford, R.F.E. and Omed, H.M. (Editors) Forage Evaluation in Ruminants Nutrition. CABI publishing, Walling ford, U.K. pp 15-42.

Butswat, I.S.R., Zahraddeen, D. and Hussaini, A.S. (2005). Prevalence of peste des pestits ruminant (PPR) and helminthiasis in sheep and goats. Bulletin for Animal Health and Production in Africa, 53: 131 – 134.

DDijkstra, J. France, J. Dhanoe, M.S. Maas, J.A. Hanigan, M.D., Rook, A.J. and Beever, D.E (1997). A model to describe growth patterns of the mammary gland during prennancy and lactation .J. Dairy Sci. 80: 2340 – 2354.

FAO (2006). Food and Agriculture organization. Quarterly Bulletin of statistics. Rome, Italy. http://fao/statistics/yearbook;may2006

FAO (Food and Agricultural Organisation of the United Nations) 1990. Production Yearbook Volume 44. FAO, Rome, Italy 283pp.

Malau-Aduli, B.S., Eduvie, L.O., Lakpini C.A.M. and Malau-Aduli, A.E.O (2004). Influence of crop residue ration supplementation on the attainment of puberty and postpartum reproductive activities of Red Sokoto does. Journal of Animal Physiology and Nutrition, 88: 1 – 10.

Malau-Aduli, B.S., Eduvie, L.O., Lakpini, C.A.M. and Malau-Aduli, A.E.O. (2001). Efforts of supplementation of the milk yield of Red Sokoto does, proceedings at the 26th Annual

conference of Nigerian society for Animal Production, (NSAP) March, 2001, ABU Zaria, Nigeria, Pp 353 – 355.

Odeyinka, S.M. and Okunade, G.K. (2005). Goat Production in Oyo State; A case study of Ogbomoso town, Nigerian Journal of Animal Production. 32(1): 108 – 115.

Otchere, E.O., Ahmed, H.U., Adenowo, J.K., Kallah, M.S., Bawa, K.K., Olorunju, S.A.S. and Voli Jr. A.A. (1987). Northern Nigeria Sheep and Goat Production in the traditional Fulani agro pastoral sector. World Animal Review. 64: 50 – 55.

Philips, I. O. (1992). Snail rearing. A backyard livestock production, snailery production guide

Zahraddeen, D., Butswat. I.S.R and Mbap, S.T. (2007). Goat production and management in Bauchi State, Nigeria. Proceedings of the 12th Annual conference of farm management association of Nigeria (FAMAN) held at the Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State, Nigeria between 3rd – 6th sep. 2007. Pp 231 – 236.

Zahraddeen D (2006).Studies on reproductive performance and milk productivity of goats in Bauchi, A PhD thesis, Animal production programme Tafawa Balewa University, Bauchi, Nigeria. Pp210