PHENOTYPIC CORRELATIONS AND RELATIONSHIP ESTIMATION BETWEEN LITTER SIZE, PARITY, BODY WEIGHT, BODY CONDITION SCORE AND BODY MEASUREMENTS IN YANKASA EWES

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ABSTRACT

Data from forty-eight (48) Yankasa ewes were used to study the phenotypic correlations and relationship estimation between litter size, parity, body weight, body length, age, body condition score and chest girth in Yankasa ewes. The data were collected at the College of Agriculture and Animal Science, Ahmadu Bello University, Mando Road, Kaduna State, Nigeria. Traits recorded were litter size, parity, body length, height-at-wither, chest girth, body condition score and age. All data were collected fortnightly. The data were analysed using the General Linear Model of SAS. The average height-at-withers, body length, chest girth, litter size, body condition score and body weight recorded were 69.0 ± 2.34cm, 66.0 ± 3.40cm, and 1.46 ± 0.04, 2.67 ± 0.10 and 32`0 ± 0.24kg respectively. Body weight had positive correlation with (P< 0.01) with HAW, BCS, BL, and parity. BL had positive correlations with CG, BCS, age and parity. CG had positive correlation with BW, HAW, BL, BCS, age and parity. The correlation coefficients recorded for the measured traits range between 0.21 and 0.89 and were significant (P < 0.01). This study also indicated that body measurements and body weight showed significant and positive correlations and the tendency to show some progress with progressing litter size, parity and age. These characters could be improved by conditioning the environment and the system of management.

Keywords: Litter size (LS), parity (P), body length (BL), body weight (BW), body condition score (BCS), height-at-withers (HAW), chest girth (CG).

INTRODUCTION

Yankasa sheep are the most widely distributed and most numerous sheep breed in Nigeria (Oni, 2002). Nigeria has about 22.3 million sheep (FDLPCS, 1991), it is estimated that Yankasa sheep constitute 60% of the total national flock and very popular among sheep farmers (Afolayan, 1996). It is a medium sized breed. The tail is long and thin, the ears are moderately long and somewhat droopy. Rams have curved horns and hairy, white mane and ewes are polled. They have white coat colour with black patches around the eyes, ears and muzzle (FAO, 2006).

It is important to increase the efficiency of sheep production (output) by improving reproductive traits, quantity and quality of growth traits, milk yield and other traits that are important economically (Vatankha *et al.*, 2008). Body conformation and growth rate of animals are important criteria for selection of breeding animals in meat producing species. In many livestock species, conformation traits have been included in the genetic evaluation procedures and selection programmes (Mandal *et al.*, 2008). Body dimensions or linear measurements have been used as indicators of body size and weight and live body weight can be predicted from body measurement (Atta and El-Khidir, 2004).

Litter size was positively correlated with parity (Awemu *et al.*, 1999, Akpa *et al.*, 2004 and Abubakar *et al.*, 2014). Parity have significant effect on body weight and it has also proved to be important in other studies of sheep in various breeds. (Yadzi *et al.*, 1998; Jafaroghi *et al.*, 2010; Mohammed *et al.*, 2010). Body condition score (BCS) is a subjective measure of nutrient reserve. It is a useful description of animals based on simple functional indicator closely associated with body composition (Thompson and Meyer, 2002). Live weight and body condition score are intimately connected to the productivity of domestic – ruminants (Robinson, 1990). Mellado *et al.* (1996) reported that infertility increased in both bucks and does as

body score decreased. The aim of this study is to determine the phenotypic correlations and relationship estimates between little size, parity, body weight, body condition score and body measurements in Yankasa ewes.

MATERIALS AND METHODS

Experimental site

The research was conducted at the teaching and research farm of the College of Agriculture and Animal Science, Division of Agricultural Colleges, Ahmadu Bello university, Mando road, Kaduna. The College is on Latitude $10^0$35'N and Longitude 7^0.25' – 26.41^{0}E, Kaduna State Nigeria. The rainfall in this area varies between 1096mm – 1544mm per annum and raining season last for 150-200 days and dry season stars from October to early April. The mean annual temperature is 34^{0}C with the hottest month being March to April (40^{0}C) and the coolest period (16^{0}C), which is between December and January, during severe harmattan (NIMET, 2014).

Animals and their Management

A total of forty-eight (48) Yankasa ewes ranging between twelve and forty-eight months of age were used for this study. The ewes were managed under semi-intensive system. The animals were released for grazing in the morning at about 8.00am and were kraaled overnight. Supplementary feeding was done using crop residues such as groundnut haulm, bean pods and maize offal. Mineral blocks and water were also provided. The animals also receive routine inspection; deworming, vaccination and treatment of ecto-parasites were carried out. All the animals were identified using ear tags.

Data Collection

Data were collected over a period of four (4) months (September to December). Body weight, height-at-withers, chest girth and body condition score (BSC) were recorded fortnightly in the morning before the animals were released for grazing. Litter size, parity and age of each animal were also recorded. Age of the animals were determined using dentition formula as per Wilson and Durkin (1984). Body weight of the animals were measured using weighing scale and values recorded in (Kg), height-at-withers was measured as the distance from the surface of a platform to the withers, while body length was measured as the distance from external occipital protuberance to the base of the tail and chest girth representing the circumference of the chest. These traits were measured using measuring tape and figures recorded in (Cm). Body Condition Score (BCS) was assessed using the 5 point scale (1 = very thin to 5 = obese) as described by Aumont *et al.*, (1994) and Thompson and Meyer (2002). The ewes' lumbar vertebrae, loin and rump areas were palpated, examined and then scored. Amount of fat deposit was determined by the use of finger tip pressure which is exerted on the back bone, pin bone and hip bone.

Statistical Analysis

The population average and standard deviations were calculated based on the means of SAS (2001). The variance analysis and multiple comparison were analysed by the General Linear Model (GLM) of SAS (2001). Significant differences were separated using Duncan Multiple Range test (SAS) (2001). Correlation and regression were computed using SAS (2001). The data were analysed using the following model:

$Y_{ijkl} = A_i + P_j + L_k + W_l + E_{ijkl}$

Y_{ijkl} = any observation

μ = the overall mean

A_i = effect of age of ewe

P_k = effect of parity of ewe

L_k = effect of litter size of ewe

W_l = effect of weight of ewe and

E_{ijkl} = residual error

RESULTS AND DISCUSSION

The summary statistics; mean $\pm$ s.e minimum and maximum values for height-at-wither (HAW), body length (BL), Chest girth (CG) and body weight (BW) are presented in Table 1. The average values for HAW, BL, CG, and BW. For first, second, third, and fourth parities were 65.0 $\pm$ 1.10, 60.1 $\pm$ 1.67, 70.0 $\pm$ 1.89cm, 20.0 $\pm$ 1.04kg, 69.0 $\pm$ 2.34, 66.0 $\pm$ 3.40, 77.6 $\pm$ 2.04cm, 32.0 $\pm$ 6.23kg, 68.8 $\pm$ 1.03, 68.0 $\pm$ 0.91, 78.5 $\pm$ 1.04cm, 31.5 $\pm$ 0.65 kg and 68.0 $\pm$ 2.00, 68.5 $\pm$ 6.50, 79.5 $\pm$ 0.50 cm, 32.0 $\pm$ 3.00 kg respectively. The coefficient of variation (cv) for body measurements ranged from 2.5 to 11.5. BW, HAW, BL, and CD seemed to increase with progressing parities of the ewes. This is in agreement with the report of Yadzi *et al.* (1998), Jafaroghu *et al.* (2010), Mohammed *et* al (2010), Abubakar *et al.* (2014) that parity have significant effect on live weight and body measurements increased with progressing parity

of the does. The values for BW, HAW, BL and CG obtained in this study were within the ranges reported in the same breed by Afolayan *et al.* (2006), Fasae *et al.* (2005) and Umar *et al.* (2015).

Phenotypic correlations amongst body weight, height-at-withers, body length, chest girth, body condition score, age, litter size and parity are presented in table 2. There was a positive correlation ($P < 0.01$) of BW with HAW, BL, CG, BCS and parity. However, non-significant effect ($P > 0.05$) of litter size and chest girth was observed. CG and BW had the highest correlation (0.89), followed by age and parity (0.83), then CG and BL (0.82). There was also a strong and positive correlation ($P < 0.01$) between age and BCS (0.71). The significant and positive correlation observed between BW, HAW, BL and CG in this study were within the range reported by Afolayan *et al.* (2006), Fasae *et al.* (2005) and Umar *et al.* (2015). The observed high and significant coefficients of correlation between BW and CG and CG and BL suggest that either of this variable or their contributions could provide a good estimate for predicting live body weight in Yankasa ewes.

CONCLUSION

The results of this study showed that body weight, body measurements, and body condition score had significant and positive correlations and the tendency to show some progression with progressing parity of the ewes. These characters could be improved by conditioning the environments for better production. It also indicated that body measurements may be useful as selection criteria for performance traits in those situations where weight measurements might not be feasible, such as small holder farmers who do not have access to the weight bridge.

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Table 1: Summary Statistics of Parity on Height-at-withers, body length, chest girth and body weight in Yankasa ewes.

Parity	No 48	Variable	Means S.E.	Min.	Max.	C.V
1	08	HAW (Cm)	65.0 ± 1.10	61.0	70.0	5.0
		BL (Cm)	60.1 ± 1.67	52.0	63.0	7.3
		CG (Cm)	70.0 ± 1.69	61.0	75.0	6.4
		WT (Kg)	20.0 ± 1.04	16.0	23.0	14.0
2	13	HAW (Cm)	69.0 ± 2.34	62.0	75.0	7.6
		BL (Cm)	66.0 ± 3.40	55.0	74.0	11.5
		CG (Cm)	77.6 ± 2.94	70.0	86.0	8.5
		WT(Cm)	32.0 ± 6.23	20.0	35.0	23.0
3	15	HAW(Cm)	68.8 ± 1.03	67.0	71.0	3.0
		BL (Cm)	68.0 ± 0.91	66.0	70.0	2.7
		CG(Cm)	78.5 ± 1.04	76.0	81.0	2.5
		WT (Kg)	31.5 ± 0.65	30.0	33.0	4.1
4	12	HAW (Cm)	68.0 ± 2.00	66.0	70.0	4.6
		BL(Cm)	68.5 ± 6.50	62.0	75.0	4.2
		CG(Cm)	79.5 ± 0.50	79.0	80.0	0.9
		WT (Kg)	32.0 ± 3.00	29.0	35.0	13.3

HAW: height-at-withers, BL: body length, CG: Chet girth, WT: body weight, Min. Minimum, Max: maximum, N: number of observation, Cv: Coefficient of variation

Table 2: Phenotypic correlations among body weight, height-at-wither, body length, chest girth, body condition score, age, litter size and parity in Yankasa ewes.

Traits	WT	HAW	BL	CG	BCS	AGE	LS	P
WT		0.6977*	0.6701*	0.8856**	0.6999*	0.5688*	0.2106*	0.5320*
HAW			0.3105	0.5512*	0.5480*	0.3423*	0.3283*	0.3841*
BL	0.6701*	0.3105		0.8187**	0.6209*	0.5483*	0.3518*	0.5389*
CG	0.8856**	0.5512*	0.8187**		0.7665**	0.5423*	0.1851*	0.6389*
BCS	0.6999**	0.5480*	0.6209*			0.7028**	0.3536*	0.7040**
AGE	0.5688*	0.3423	0.5483	0.5423*	0.7028*		0.5195*	0.8269**
LS	0.2106*	0.3283	0.3519	0.1851^{NS}	0.5195*			0.4987*
P	0.5320*	0.3841	0.5389*	0.6388*	0.7040*	0.8269	0.4978*	

* :P < 0.05, **: P < 0.01, WT: Body weight, Haw: height-at-withers, BL: Body length, CG: Chest girth, BCS: body condition score. Ls: Litter size and P: parity.