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Effect of Gestation Length and Birth Weight on Crossbred West African Dwarf and Red Sokoto Goats reared in Ebonyi State, Nigeria

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ABSTRACT

A total of 70 Kids were used to study the effects of genotype and birth weight on gestation length of Crossbred West African Dwarf and Red Sokoto Goats reared in the Humid Tropics. The study was carried out at the Small Ruminant Research Unit of Dora-Pet Farms Ltd Ngbo, Ohaukwu LGA of Ebonyi State. Detection of Heat (estrus) was carried out twice daily; in the morning (07:00-08:00am); and in the evening (05:00-06:00pm) using the active bucks. The data obtained were subjected to analysis of variance using General Linear Model and Correlation Procedure of SAS. Most of the genotypes had similar gestation length with values between 161.5±0.23 days and 163.7±0.40 days, except for Red Sokoto pure breed (RS X RS) kids which had a shorter gestation length (142.3±0.54 days). The birth weight of kids showed significant difference (P<0.05) with the crosses between West African Dwarf goats (WAD x RS) Does having a higher birth weight of 4.1±0.04 kg while the crosses obtained using RS x WAD gave the lowest birth weights (2.1±0.24 and 1.9±0.12, respectively). There were no significant effect (P>0.05) of Sex and litter type on gestation length. Although, birth weight was however affected by sex of kids and their litter type. Litter type showed negatively correlation with birth weight (-0.218). Gestation length had a low and non-significant relationship with birth weight; litter type and genotype of the kid. Kid genotype does not have a significant relationship with litter type. Therefore, improvement on the genetic makeup of Nigeria goat breeds is possible if the resources within and between breed is carefully exploited. Consequently, selection for a reduction in gestation length can increase prolificacy of the West African Dwarf and Red Sokoto using skillful crossbreeding procedures.

Key Words: Gestation Length, Birth Weight, Breeds, Goat, Ebonyi State.

1.0 INTRODUCTION

The genetic improvement of indigenous breeds of goats is currently very important because they have valuable resources for economic development and poverty alleviation (Okafor *et al*., 2016). They can adapt to extreme harsh environmental conditions, pests and diseases; and as such be more productive in their own environment than exotic breeds (Fajemilehin and Salako, 2008). Genetic variation between and within a breed is described as diversity and it is a valuable asset as the adaptability of a population, depends on it (Woolliams *et al*., 2005). Genetic structure of goat breeds can provide reliable information for the selection of parental material and assist in breeding programs. Goat *(Capra hircus)* is one of the smallest domesticated ruminants which are managed for the production of milk, meat, wool and leather particularly in arid, semitropical or mountainous countries (Morand-Frhed, 2004). In Africa, indigenous goats are important resource for farmers, providing meat, milk, manure, fibres and hides, and satisfying various cultural and religious functions (TECA, 2006). Survival of indigenous goat population in Africa is threatened by diseases, adverse climatic conditions, civil strife, the pressure of economic development,

abandonment of traditional farming practices, and more importantly crossbreeding or replacement with animals from the developed world (Tesfaye, 2014).

According to Debele *et al*., (2011), goat is the most important of the domestic animals to man in the tropics. Goats have a variety of functions and in comparison with other ruminants display a unique ability to adapt and maintain themselves in harsh environments. According to Bellows and Ansotegui (2005), gestation length is the physiological period during which the fetus develops in the dam. Gestation length is affected by several factors including sire breed (Fogarty *et al*., 2005), dam age, litter size and lamb weight at birth (Amoah *et al*., 1996). Longer gestation lengths had been recorded in older dams by Vatankhah *et al*. (2000) and Koyuncu *et al*. (2001).

Of the several indigenous breed in Nigeria, the WAD goat is predominant in the humid rainforest agro-ecology of southern Nigeria. They are highly prolific, hardy and have a short generation interval (Ngongeh and Onyeabor, 2015). Morphological characterization of the WAD goat has been undertaken in a number of studies (Situma *et al*., 2014; Shoyombo *et al*., 2015; Birteeb *et al*., 2015). These studies have shown the inter relationships between various linear body measurements and body weight at different ages. Ewes carrying single lambs also had influenced gestation length (Knight *et al.,* 1988; Osinowo *et al*., 1994; Vatankhah *et al*., 2000; Fogarty *et al*., 2005) and may be longer when the dam is carrying a male lamb (Koyuncu *et al*., 2001; Vatankhah *et al.,* 2000; Fogarty *et al*., 2005). Bradford *et al*. (1972) and Dwyer *et al*. (1996) concluded that genotype of the sire is more important than the dam in determining gestation length. Selection for a reduction in gestation length may indirectly increase prolificacy (Osinowo *et al*., 1994; Vatankhah *et al*., 2000).

It is a laudable proposition that more attention be given to the genetic importance and development of the WAD goats, since its productivity can offer a quicker means of bridging the gap currently existing in animal protein consumption in the country (Muyideen *et al*., 2018). Improvement in WAD goats will increase meat and milk production, which will provide animal protein that are indispensable to a balanced human diet, as such go a long way to solve the present acute animal protein shortage in Nigeria. This study was therefore aimed at evaluating the effect of genotype and birth weight on gestation length of West African Dwarf and Red Sokoto Goats and their crosses.

2.0 MATERIALS AND METHODS

The study was carried out at the Goat Section of Small Ruminant Research Unit at Dora-Pet Farms Ltd Ngbo, Ohaukwu LGA of Ebonyi State. Ngbo is situated within the South Eastern part of Nigeria. It exist on latitude 6°40'N, 7°30' and Longitude 5°40' and 6°45'E., and 91.44m above sea level in the derived

Savannah of South eastern agro-ecological zone of Nigeria. The minimum and maximum temperatures of the area are 27°C and 31°C respectively (Ofomata, 1995). West African Dwarf and Red Sokoto goats were used for the study which were subjected to diallel crossing. Heat (estrus) detection was carried out twice daily; in the morning (0700-0800 hours); and in the evening (1600-1700 hours) using apron fitted rams to pick does on heat. Does on estrus were separated from the herd into an isolated pen with an appropriate buck required for mating. These were allowed to be together for four (4) days under the assumption that mating would ensue. Pen mating was carried out at the ratio of 1buck to 12 does. The does were returned back to their herd after the fourth day when the required records had been taken. Gestation length was calculated as the number of days between the date of successful mating and kidding. Birth weight and litter type of each kid was recorded immediately after birth. A total of 70 kids were used for this study. The pure breed were 15 West African Dwarf goat (WD X WD) and 15 (RS X RS) while the crosses were 15 (WAD X RS), 15 (RS X WAD). The data obtained were subjected to analysis of variance using General Linear Model of SAS (SAS, 2004). Correlation between parameters were calculated. Where analysis of variance depicted significant differences, Duncan Multiple Range Test (Steel and Torrie, 1980) was used to separate the means.

3.0 RESULTS AND DISCUSSION

3.1 The mean effect of kid genotype on gestation length and birth weight is shown in Table **1**. All the genotypes had similar gestation length with values between 161.5±0.23 days and 163.3±0.40 days except for Red Sokoto pure breed (RS X RS) kids which had a shorter gestation length (142.3±0.54) days. The values recorded in this study were higher than 148 days reported by McNeal (1987) as average length of gestation in sheep. Bradford *et al*. (1972) had explained that the genotype of the lamb is more important than the dam in determining gestation length. Fogerty *et al.* (2005) reported 2-3 days variation in gestation length due to sire breed. Dwyer *et al*. (1996) reported that irrespective of ewe breed, gestation length was longer for Suffolk than for Scottish Blackface lambs. There were a wide variation in the birth weight of kids with the crosses between West African Dwarf bucks and Red Sokoto does recording a distinct birth weight of 3.9±0.08 kg while the crosses obtained between Red Sokoto bucks and West African Dwarf does had the least birth weights (2.0±0.15 and 1.9±0.22, respectively). The birth weight obtained for pure breed kids of WAD X WAD (1.8±0.11) and RS X RS (1.9±0.05) were lower than 2.6 kg, 2.7 kg and 2.8 kg reported by Atencio *et al*. (1979), Gonzalez (1972) and Bodisco *et al.* (1973), respectively for West African Dwarf sheep. Combellas *et al*. (1979) also reported higher birth weight of 2.6 kg and 2.4 kg, respectively for Black-headed Persian ruminant. The birth weight of pure breeds (WAD x WAD and RS x RS) were lower than the birth weight of crosses (WAD x RS and RS x WAD). This result can be attributed to direct effects of heterosis.

Table 1. Effect of Genotype on Gestation Length and Birth Weight of Kids

Genotypes	N	Gestation length (days)	Birth weight (kg)
WAD x WAD	15	142.5±0.57[a]	1.9±0.22[b]
RS x RS	15	150.3±0.18[a]	2.1±0.16[b]
WAD x RS	15	161.5±0.23[b]	3.9±0.04[a]
RS x WAD	15	163.7±0.40[a]	3.7±0.19[a]
Total	60	160.2±0.33	2.0±0.08

Means having different superscript at the same column differ significantly (P<0.05). N = Number of Kids

3.2 Effect of sex and litter type on gestation length and birth weight

Table 2 showed that sex and litter type have no significant effect (P>0.05) on gestation length. Birth weight was however affected (P<0.05) by sex of the kids and their litter type. This report is in agreement with the records of Robinson *et al*. (1977) who stated that as the number of fetuses increases, the number of caruncles attached to each fetus decreases, thus reducing the feed supply to the fetus and hence the birth weight of the lambs in the uterus.

The males had a higher birth weight than the females while the kids given birth to as singles (2.1±0.63) were heavier than those given birth to as twins (1.8±0.16). According to Klindt (2005), endocrine functions are often sexually dimorphic, different in males and females. He explained further that programming of sexual dimorphism begins with embryonic expression of the sex-determining gene (SRY) in males and secretion of Mullerian-inhibiting hormone which prevents development of internal reproductive tracts of females.

Table 2 shows t h e Effect of sex and litter type on gestation length and birth weight

	N	Gestation length (days)	Birth weight (kg)
Sex			
Male	20	157.3±1.22	2.7±0.47[a]
Female	40	154.1±0.50	2.3±0.45[b]
Litter type			
Single	35	153.3±0.81	2.1±0.63[a]
Twins	15	152.0±0.15	1.8±0.12[b]
Total	60	152.3±0.43	2.0±0.07

Means bearing different superscript at the same column differ significantly (P<0.05). N = Number of lambs

3.3 Shows the Correlation coefficients of Birth weight, Litter type and kid genotype

Table 3 showed Correlation between birth weight, litter type and kids genotype. Litter type was negatively correlated with birth weight (-0.372; P<0.01). This report is similar to the finding of the Osinowo *et al*. (1994; Vatankhah *et al*., 2000) who stated that birth weight of ruminants decreases as the litter number increases (Knight *et al*., 1988;; Fogarty *et al*., 2005). Gestation length had a low and non-significant relationship with birth weight (0.114; P>0.05); litter type (0.054; P>0.05) and lamb genotype (-0.101; P>0.05). The kid genotype does not have a significant relationship with litter

type (0.171; P>0.05).

Table 3 shows the Correlation coefficients of Birth weight, Litter type and kid genotype

Parameters	Gestation Length	Birth Weight	Litter Type
Birth weight	0.233^{NS}		
Litter type	0.141 ^{NS}	-0.218**	
Kid genotype	-0.130 ^{NS}	-0.118 ^{NS}	0.142^{NS}

** Correlation was significant at the 0.01 level.
^{NS} Correlation is not significant.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Genetic improvement of West African Dwarf and Red Sokoto breeds of goat is possible if the resources of within and between breed is carefully exploited. Selection for a reduction in gestation length can lead to increase prolificacy of the West African Dwarf and Red Sokoto using skillful crossbreeding procedures.

4.2 RECOMMENDATIONS

It is recommended that more breeding programmes in West African Dwarf and Red Sokoto breeds of goat production should be encouraged in other to have a larger population of them reduce the cost and inadequate provision of animal protein to meet the demand of the country.

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