



# **Influence of Age on Physiological Characteristics of West African Dwarf Bucks Raised in the Guinea Savannah Zone of Nigeria**

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## **ABSTRACT**

Fifty four West African Dwarf (WAD) bucks, 4 to 15 months old were assessed to measure the influence of age on body weight, body temperature (rectal, skin and scrotal), respiratory rate, pulse rate and heart rate. Highest mean body weight; 15.33+0.76kg was recorded for the 14 months old bucks, while the lowest, 5.50+0.50kg was recorded for the 4 months old WAD bucks respectively. The rectal temperature ranged from 37.70 +0.00 to 39.00+0.00°C, the skin temperature varied from 37.80± 0.00 to 38.95+ 0.15°C. The scrotal temperature ranged from 34.23+0.07 to 35.30+0.00°C. The mean respiratory rate of 31.57+1.66 beats per minute (bpm) was the highest for the 8 months old bucks, followed by 29.00 +0.91 for the 7 months old bucks, while the lowest, 18.67±1.20 bpm was recorded for the 11 months old WAD bucks. The mean pulse rate for the 9 months old bucks; 101.00+0.00 bpm was the highest, followed by 89.33+2.73 for the 13months old buck. Lowest pulse rate of 68.00+0.00 bpm was recorded for the 5months old bucks, while the 15 months old bucks had an average value of 84.33+ 4.18bpm. The lowest heart rate value of 83.33+9.94 bpm was recorded for the 15 months old bucks, while highest average value of 101.00+0.00bpm was recorded for the 9 months old bucks. Age was found to have significant (P<0.05) effect on body weight, as well as, respiratory rate and pulse rates but however, did not have any significant (P>0.05) effect on the rectal, skin and scrotal temperatures and heart rate.

**Keywords:** West African Dwarf bucks, body temperature, physiological parameters

## **INTRODUCTION**

West African Dwarf (WAD) goats are found in large number in the southern part of Nigeria, and most especially in the rural areas. They possess the widest margin of adaptation amongst the ruminants (Oni, 2003). They are small, hardy, early maturing, prolific, non-seasonal breeders (Osuagwuh and Okpokodje, 1982). They are plump, measuring less than 50cm in height and weigh between 20-25kg and are trypanosome tolerant (Ozoje, 2002). Heat is a major constraint of animal productivity in the tropical belt and arid areas (Silanikove, 1992); solar radiation in the tropics considerably increases thermal load on animals grazing during the day. High ambient temperature depresses body activities and such overheating creates physiological stress that could invariably affect production by promoting an unfavourable endocrine balance, metabolism or by reducing feed intake. The amount of radiant heat absorbed by the animal's coat is partly determined by coat colour, length and conditions of its hair (Acharya *et al.*, 1995). Heat stress affects livestock productivity vis-à-vis milk production, body growth, prenatal growth, postnatal growth, wool growth and production. Domestic animals are homeotherms; therefore, excess heat must be eliminated for the animal to be in a thermal balance state. The general homeostatic response to thermal stress in mammals include raised respiration rate (Yousef, 1985), panting, drooling, reduced heart rates, positive sweating (Blazquez *et al.*, 1994), decreased feed intake (Silanikove, 1992) as well as

reduced milk production (Albright and Alliston, 1972; Liu, 1989). The most common index of heat tolerance in mammals is core body temperature, measured by rectal temperature (Liu, 1989; Silanikove, 1992), respiratory rate and moisture vaporization rate (Silanikove, 1992). Osakwe and Smith (2004) noted that stress from environmental conditions can produce a reduction in reproductive performance, as well as, meat and egg. In addition, changes in rectal temperature, pulse rate and respiratory rate have frequently been used as indices of psychological adaptability to tropical environments (Oladimeji *et al.*, 1996). Trenkle and Marple (1983) assumed that as the animals gain weight, there are corresponding adjustments in the maintenance heat, and heat production can be estimated from rectal temperature measurements. This research was therefore conducted to assess the physiological parameters of WAD bucks, as well as, to ascertain the influence and relationship between the age of the bucks and physiological parameters such as weight, rectal temperature, skin temperature, scrotal temperature, respiratory rate, pulse rate and heart rate.

## MATERIALS AND METHODS

The study was carried out between June and August among village farmers in Makurdi town, Shamija town around the University of Agriculture, Makurdi, in Makurdi Local Government Area, as well as, Anyiin Community in Logo Local Government Area, all in Benue State, Nigeria. All the parameters were taken at the same time from each goat, within 6.00 and 8.00am every day. The age of fifty four bucks of 4-15 months of age was obtained by oral interview from the holders of the animals while the weights were determined using a bathroom scale according to the method of Scott (1998). The weight of the person carrying the goat was first of all taken before the goat was carried. The difference between the later weight and previous (human being) was recorded as the weight of the goat. The rectal temperature was taken with a digital thermometer which was first washed and lubricated with water in order to avoid traumatizing the animal and then gently inserted into the rectum (Sastry and Thomas, 1981) at about 3cm deep for a minute. The values were read in degree centigrade ( $^{\circ}\text{C}$ ). The skin and scrotal temperatures were taken with a digital thermometer after the areas were respectively shaved with a pair of scissors. The pulse rate was observed directly by counting the beats of the pulse when felt with the index finger at the femoral artery; on the medial aspect of the hind limb for one minute and recorded as beats per minute. The respiratory and heart rates were taken with a stethoscope which is noted for audibility and counted as beats per minute using a stop clock for timing. The number of breaths or beats were counted in 15 seconds and thereafter, multiplied by 4. The analysis of variance (ANOVA) was according to Microsoft Excel (2007). The Least Significant Differences (LSD) was used to separate the means of the parameters measured.

## RESULTS AND DISCUSSION

The Table below shows the influence of age on body weight, rectal temperature, skin temperature, scrotal temperature, respiratory rate, pulse rate and heart rate of WAD bucks. Rectal temperature values varied from  $37.70 \pm 0.00^{\circ}\text{C}$  for the 5 months old bucks to  $39.00 \pm 0.00^{\circ}\text{C}$  for the 4 months old bucks. Skin temperature values varied from  $37.80 \pm 0.00^{\circ}\text{C}$  for the 9 months old bucks to  $38.95 \pm 0.15^{\circ}\text{C}$  for the 4 months old bucks, while the scrotal temperature ranged from  $34.23 \pm 0.07^{\circ}\text{C}$  for the 13 months old bucks to  $35.30 \pm 0.00^{\circ}\text{C}$  for the 5 months old bucks. Respiratory rate values were lowest ( $18.67 \pm 1.20\text{bpm}$ ) for the 11 months old bucks and highest ( $31.57 \pm 1.66\text{bpm}$ ) for the 8 months old bucks. Pulse rate values were highest ( $101.00 \pm 0.00\text{bpm}$ ) for the 9 months old bucks and lowest ( $68.00 \pm 0.00\text{bpm}$ ) for the 5 month old bucks, while heart rate values varied from  $83.33 \pm 9.94\text{bpm}$  for the 15 months old bucks to  $101.00 \pm 0.00$  for the 9 months old bucks. The overall weights of the animals increased significantly ( $P < 0.05$ ) with age, ranging from  $5.50 \pm 0.50\text{kg}$  for the 4 months old bucks to  $15.33 \pm 0.76\text{kg}$  for the 14 months bucks. These values are comparable to those of Otoikhain (2008) who recorded mean body weights of  $10.22 \pm 0.22$ ,  $15.75 \pm 0.16$  and  $32.00 \pm 0.11\text{kg}$  for West African Dwarf goats of 0.5-1, 1-1.5, 1.5-2 and 2-2.5 years old respectively. Fraser (1991) reported reference temperature and heart rate values of  $39.1^{\circ}\text{C}$  and 90 beats/min for goats and respiratory rate value of 19 breaths/min for sheep. These values are comparable

to some of the values recorded in this research. The heart rate, as well as, skin, rectal and scrotal temperatures were not significantly ( $P>0.05$ ) affected by the age of the bucks. This implies that these parameters were not influenced by age of the WAD bucks. Rectal temperatures obtained in this work were less than values documented by Lorrie (2013) and Ozung *et al.* (2011) who obtained temperature ranges of 39.30-40.00°C and 39.00-39.50°C in WAD goats at maturity. The highest rectal temperature (39.00±0.00°C) obtained for the 4 months old bucks (youngest) agree with the report of Sastry and Thomas (1981) who stated that young animals, females in late pregnancy and excited animals frequently show high temperatures than normal. Skin temperature values recorded in this study falls within the ones reported by Jean (1990) and normal ranges of 37-40°C for goats. The highest mean scrotal temperature recorded for the 4 months old bucks indicate that younger animals usually have higher body temperatures (Sastry and Thomas, 1981). Greg and David (2010) reported that factors such as body size, age, exercise, excitement, environmental temperature, pregnancy and fullness of digestive tract affect respiratory rate, Respiratory rate values recorded in this research are similar to results documented by Ozung *et al.* (2011) and Lorrie (2013) who obtained values of 10-30 and 15-30 bpm respectively under semi-intensive management conditions. Values of pulse rate were significantly ( $P<0.05$ ) affected by age. Ozung *et al.* (2011) and Lorrie (2013) recorded pulse rate values of 60-100 and 60-80 bpm which are within normal limits for goats. The highest mean heart rate of 101.00 bpm was the same as that of the pulse rate for the 9 months old bucks which agrees with the findings of Lorrie (2013) that heart rate is the same as pulse rate. Greg and David (2010) and Ozung *et al.* (2011) pointed out that such factors as activity, fitness level, air temperature, body position (standing up or lying down), emotions, body size, medication, age, sex, breed, time of the day, exercise, eating and excitement could influence pulse and heart rate. The respiratory and pulse rates were significantly ( $P<0.05$ ) affected by age of the bucks. Pulse rate values recorded by Lorrie (2013) and Ozung *et al.* (2011) were within the range of values recorded in this work. These values generally declined from the 10<sup>th</sup> week as the bucks aged.

## CONCLUSION

From the results, it was concluded that age had a significant ( $P<0.001$ ) effect on the body weight, as well as, respiratory and pulse rates of the bucks. Meanwhile, the skin, rectal and scrotal temperatures, as well as, heart rates were not significantly ( $P<0.05$ ) affected by age of the bucks.

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