ISSN No:-2456-2165

Profiling Thermoregulatory Parameters of Northwestern Nigerian Donkeys (*Equus asinus*)

Bature, I[1], Lamido, M[1] and Yahaya, M.A.[1]
[1]Department of Animal Science, Faculty of Agriculture, Federal University Dutsin-Ma.

Abstract:- The main aim of the present study was to determine the range of thermoregulatory parameters of Northwestern Nigerian donkeys and also analyzed how these thermoregulatory parameters vary with gender and age under tropical condition. The study was conducted by taking thermoregulatory parameters of one hundred and twenty-five (125) donkeys across three selected Northwestern states of Nigeria. All measurements and sampling were performed twice in a day morning (6am to 8am) and evening (5pm to 7pm). Rectal temperature was measured from the rectum of donkeys using digital thermometer, pulse rate was taken from heat location using stethoscope and respiratory rate was assessed by closely observing number of nostril movements per minute. The Data obtained were analyzed using the GEN-STAT software (2014). From the analyzed results, there was significant difference (P < 0.05) in thermoregulatory parameter of respiratory rate between male and female donkeys with female donkeys having the higher value (26.70 breath/minute) compared to male with 25.77 breath/minute. There is also significant difference (P < 0.05) in thermoregulatory parameters of rectal temperature, respiratory rate and pulse rate among donkeys of various age groups. The younger donkeys had the highest values of 37.85°C, 27.39 breath/minute and 56.95 beat/minute for thermoregulatory parameters of rectal temperature, respiratory rate and pulse rate respectively compared to 37.61 °C, 25.84 breath/minute and 48.36 beat/minute for adult donkey and 37.51 °C, 25.50 breath/minute and 48.86 beat/minute in old donkeys. From the result of this study; it can be concluded that thermoregulatory parameters of rectal temperature, pulse rate and respiratory rate varies according to age and gender. Further researches should be conducted across geopolitical zones of Nigeria using large number of donkeys.

Keywords:- *Donkey, Thermoregulatory, Rectal Temperature, Pulse Rate, Respiratory Rate.*

I. INTRODUCTION

In Tropical Africa donkey (*Equus asinus*) has been used as draught animal mainly for transportation; conveying agricultural produce to the market or pulling of carts and other farm tillage equipment (Blench *et al.*, 2004; Hassan *et al.*, 2013). However, donkey production in tropics is constraint by many factors such as poor nutrition, diseases infestation, poor genetic potentials, poor management and harsh environmental conditions (Simenew *et al*., 2011). However, out of all these factors, poor nutrition and disease infestation are rampant with significant impact on the performance of animals (Crane, 1997). Donkeys are known to be hardy animal and can survive with little management. It has been established that rectal temperature, respiratory rate and heart rate are thermoregulatory parameters for immediate evaluation of stress, health and adaptability status of livestock animals (Minka and Ayo 2007; Dey *et al.*, 2010). Disease diagnosis in livestock is largely dependent on thermoregulatory examination and laboratory results expected to reflect biological variations and this in turn requires understanding of the basal thermoregulatory profiles of an apparently healthy animal whose measurement provides invaluable information concerning the health status of an animal (Mori *et al.*, 2004). However, unlike other domestic livestock species, there are very scanty research information on the baseline thermoregulatory parameters of the donkey in Nigeria. Therefore, a study on the donkey to determine the reference thermoregulatory parameters is necessary and this will provide a basis for interventions that will improve the productivity and health of the donkey.

II. MATERIAL AND METHOD

Study Location

The field research was conducted in three selected northwestern states of Nigeria; Katsina, Zamfara and Jigawa. Within each state three (3) local governments areas with sizable donkey population were selected. The local governments covered in Katsina were Kurfi, Daura and Dandume, in Zamfara were Tsafe, Kauran Namoda and Bakura and in Jigawa were Roni, Kiyawa and Maigatari.

Experimental Animals

A total of one hundred and twenty-five (125) donkeys owned by subsistence farmers were randomly sampled from all the villages of three selected Northwestern Nigerian states. They consist of forty (40) from the three Local Governments areas in Katsina (Kurfi, Daura and Dandume), forty three (45) from the three local government areas in Zamfara (Tsafe, Kauran Namoda and Bakura) and forty (40) from three Local Government Areas in Jigawa (Roni, Kiyawa and Maigatari). The animals were grouped according to their gender and age. There were total of 66 males and 59 females sampled across the three states. The animals were divided into three age groups namely; Young (≤3 years, N = 33), Adult (3 - 10 years, N = 53) and Old (> 10 years, N = 39) (Table 1). The ages of the animals were determined using dentition (Crane, 1997).

ISSN No:-2456-2165

Physiological measurements of Donkey

All measurements and sampling were performed during hot season (March to May). The sample were taken twice in a day morning (6am to 8am) and evening (5pm to 7pm). Thermoregulatory parameters such as rectal temperature (ºC), respiratory rate (breath/minute) and pulse rate (beat/minute) were measured by following routine clinical procedures. Rectal temperature was measured from the rectum of donkeys using digital thermometer, pulse rate was taken from heat location which is below the left side of the cardiac region behind the elbow by using stethoscope and respiratory rate was assessed by closely observing number of nostril movements per minute as reported by Wosu (2002).

Data Analysis

The Data obtained were analyzed using the GEN-STAT software (2014).

III. RESULTS AND DISCUSSION

The mean rectal temperature of 37.65^{O}C detected from the experiment were similar to 37.70ºC obtained by Etana *et al* (2011), 37.67ºC obtained Lemma and Moges (2009), 37.60 ºC obtained by AL-Busadah and Homeida (2005) and 37.70 ºC obtained by French and Patrick (1995). The value was slightly higher than 37.47 ºC reported by Simenew *et al.*, (2011).

The higher rectal temperature observed in younger donkeys agree with similar result reported by Etana *et al.*, (2011) and French and Patrick (1995). This high rectal temperature in younger donkeys may be due to their high metabolic rate (Fielding and Krause, 1998).

Respiratory rate was measured using nostril movement method this is because Etana *et al.*, (2011) reported that there was no significant different ($P > 0.005$) among the three methods of abdominal movement, nostril movement and tracheal sound and he used in measuring respiratory rate. The mean value for respiratory rate (breath per minutes) in the present study is (26.2 breath/minutes) and this was similar to the 26.9 breath/minutes reported by Etana *et al.*, (2011). The value was lower than 40.89 breath/minutes reported by Simenew *et al.*, (2011) and higher than 14.0 breath/minutes obtained by AL-Busadah and Homeida (2005). The younger donkeys had faster respiratory rate than adult and old donkeys in the current study and this agree with the report of Etana *et al.*, (2011) and French and Patrick (1995). Female donkeys respire faster than males (26.70 breath/minutes v 25.77 breath/minutes). This agreed with report by Etana *et al.*, (2011) who reported 28.40 for female and 27.50 for male donkeys respectively. This is because the volume of female lungs were smaller than that of a males lungs, thus, females have a slightly faster respiratory rate and also more oxygen (O_2) is needed and more carbon di oxide (CO_2) needs to be exhaled out of the body.

The mean pulse rate (beat per minute) in the present study was (51.13 beat/minutes). This was similar to the 51.65 beat/minutes reported by Simenew *et al* (2011) and 51.00 beat/minutes described by Canocoo *et al.*, (1991). The value was somewhat higher than 46.5 beat/minutes reported by Al-Busadah and Homeida (2005) and 47.89 beat/minutes reported by Etana *et al.*, (2011). These slight variation in pulse rate from the present study might be due to variations in environmental and geographical locations. The pulse rate of young donkeys (56.95 beat/minutes) was higher than adult and old donkeys. This agreed with similar report of (55.40 beat/minutes, 47.60 beat/minutes and 47.60 beat/minutes) reported by Etana *et al.*, (2011) for young, adult and old donkeys. The mean pulse rate value for an adult (48.36) and old (48.86) donkeys were statistically similar and somewhat higher compared to values of 47.60 reported by Etana *et al.*, (2011) and the 43 reported by Canocoo *et al.*, (1991). These slight differences in pulse rate might be as a results of variations in environmental conditions.

Table 1: Mean thermoregulatory parameters of donkey in Northwestern Nigeria

Parameters	Number	Mean ± S.E	Minimum	Maximum	C.V
TEMP (ºC)	125	37.65±0.03	35.5	38.4	0.98
RESP(Breath/min)	125	26.2±0.21	18.0	34.0	8.84
PR (Beat/min)	125	51.13±0.54	42.0	64.0	11.7

TEMP: Rectal Temperature, RESP: Respiratory Rate, PR: Pulse rate, S.E: Standard error, C.V: Coefficient of variation.

Table 2: Variation due to gender on thermoregulatory parameters of donkey

Parameters	Number	Male	Female	S.E.M	LOS
TEMP (ºC)	125	37.65	37.66	0.04	NS
RESP (Breath/min)	125	25.77^{b}	26.70^{a}	0.02	*
PR (Beat/min)	125	51.38	50.88	0.50	NS

S.E.M: Standard error of mean. LOS: Level of Significance. TEMP: Rectal Temperature. RESP: Respiratory Rate. PR: Pulse rate, The means values within rows with different superscript are significantly different.

*= P<0.05

ISSN No:-2456-2165

Table 3: Variation due to age groups on thermoregulatory parameters of donkey

Parameters	Young	Adult	Old	S.E.M	LOS
TEMP (°C)	37.85[a]	37.61[b]	37.51[b]	0.06	*
RESP (Breath/min)	27.39[a]	25.84[b]	25.50[b]	0.33	*
PR (Beat/min)	56.95[a]	48.36[b]	48.86[b]	0.80	**

S.E.M: Standard error of mean. LOS: Level of Significance. TEMP: Rectal Temperature. RESP: Respiratory Rate, PR: Pulse rate.
The means values within rows with different superscript are significantly different.
*= P<0.05
**= P<0.01

REFERENCES

[1]. AL-Busadah, K. A. and Homeida, A. M. (2005). Some Physical Variables, Biochemical and Haematological Parameters in Hassawi Ass. *Scientific Journal of King Faisal University (Basic and Applied Sciences)*, 6(1), 145-152.

[2]. Blench, R. M., De Jode, A. andGherzi, E. (2004). Donkeys in Nigeria: history, distribution and productivity. In: Starkey, P. and Fielding, D. (Eds) *Donkeys, people and development.* A resource book of the Animal Traction Network for Eastern and Southern Africa (ATNESA). CTA, Netherlands, Pp 210-219.

[3]. Canacoo, E. A., Eliis-Sackey, G. J. and Quashie, B. S. (1991). Some physiological values of apparently healthy donkeys in Ghana. *Proceedings of the international Colloquium*, Edinburgh, Scotland, 3rd - 6th September, pp. 98-102.

[4]. Crane, M. (1997). Medical aspect of equines. In: Crane, M. (Ed) *The professional handbook of the donkey*. 3rd Edition. Book limited, London, 19-35.

[5]. Dey, S., Dwivedi, S.K., Malik, P., Panisup, A.S., Tandon, S.N. and Singh, B.K. (2010). Mortality associated with heat stress in donkeys in India. *Journal of Veterinary Research*, 166, 143 – 145.

[6]. Etana, M., Endeabu, B., Jenberie, S. and Negussie, H. (2011). Determination of reference physiological values for working donkeys of Ethiopia. *Ethiopian Journal of Veterinary Science*, 15 (1), 79 – 86.

[7]. Fielding, D. and Krause, P. (1998). Donkeys. *The Tropical Agriculturalist*. CTA., Macmillan.

[8]. French, J. M. and Patrick, V. H. (1995). Reference values for physiological and biochemical parameters in domestic donkey (*Equus asinus*). *Equine Veterinary Journal*, 7(1), 33 – 35.

[9]. GenStat (2008). *Gen Stat for Windiws.* VSN International; Hemel Hempstead.

[10]. Hassan, M. R., Steenstra, F. A. and Udo, H. M. J. (2013). Benefits of donkeys in rural and urban areas in Northwest Nigeria. *African Journal of Agricultural Research*, 8(48), 6202 – 6212.

[11]. Lemma, A. and Moges, M. (2009). Clinical haematological and serum biochemical reference values of working donkey (*Equus asinus*) owned by transport operators in Addis Ababa, Ethiopia. *Livestock research and development*, 21, 1 – 12.

[12]. Minka, N. S. and Ayo, J. O. (2007). Road transportation effect on rectal temperature, respiration and heart rates of Ostrich (Struthio camelus) chick. *Veterinary archives*, 77(1), 39 – 46.

[13]. Mori, E., Mirandola, R. M. S., Ferreira, R. R., Oliveira, J. V., Gacek, F. and Fernandes, W. R. (2004). Reference values on haematologic parameters of the Brazilian donkey (*Equus asinus*) breed. *Journal Equine Veterinary Science*, 24(7), 271-276.

[14]. Simenew, K., Gezahegne, M., Getachew, M., Wondjefraw, M., Alemayehu, L. and Eyob, L. (2011). Reference value of clinically important physiological, haematological and serum biochemical parameters of apparently health working Equids of Ethopia. *Global Veterinaria*, 7(1), 1 – 6.

[15]. Wosu, L. O. (2002). *The Veterinarian's Handbook* (1st edition). Mike social press, Nsukka, Nigeria, Pp. 268.