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THERMOREGULATORY PARAMETERS OF FRIESIAN X BUNAJI HEIFERS FED VARYING LEVELS OF FEED GRADE SELENIUM AND VITAMIN E

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ABSTRACT

An experiment was conducted to evaluate the effect of feeding inorganic feed grade selenium and vitamin E thermoregulatory parameters of Friesian x Bunaji heifers. A total of twenty Friesian x Bunaji heifers were used. The study consisted of four treatments with five animals per treatment in a Completely Randomized Design (CRD). Treatment I served as Control without Selenium or Vitamin E supplementation, II, III and IV consist of was supplementation with: 3 mg of feed grade Selenium' 20 mg of feed grade Vitamin E, and a combination of 3 mg feed grade Selenium and 20 mg of Vitamin E respectively The treatments were administered once a week while feed and water was provided *ad libitum* throughout the experimental period Thermoregulatory parameters namely respiratory rate (RR), rectal temperature (RT) and pulse rate (PR) were measured at the commencement and subsequently four weeks and eight weeks after the commencement of the study The results of the study showed that there were no significant ($p>0.05$) differences in thermoregulatory parameters measured during the first and third month of supplementation. However, during the second month of supplementation, RR (25.40-30.00 breath/min) and RT (38.60-39.32^{0}C) were similar ($p<0.05$) among heifers supplemented with selenium, vitamin E and combination of Se + vitamin E treatments all of which were significantly ($P<0.05$) higher than in those on the control treatment. From this study it can be concluded that though respiratory rates and rectal temperatures of heifers supplemented with graded levels of selenium and vitamin E were within the reference points for healthy cattle, pulse rates were slightly above the normal value.

Keywords: Friesian x Bunaji, Thermoregulatory, Selenium, Vitamin E

INTRODUCTION

Climate and weather are important environmental factors that could affect the feeding and management of livestock all over the world (Nienaber and Hahn, 2007). Therefore it has been shown that an effective physiological regulation under high climatic conditions seem to be expressed by animals through systematic reduction of heat load or increasing heat loss via rectal temperature and respiratory rate (Aggarwal and Singh, 2008).

Body temperature is the measure of warmth of a living body (Jeffrey and Michael, 2010). Attempts to measure body temperature of cattle have been made at various anatomical locations including rectum, ear (tympanic), vagina, reticulum-rumen and udder (milk) (Prendiville *et al*., 2002). An animal's body temperature is actually the result of the balance between heat produced by the basal metabolism and muscular activity of the body, and the heat lost from the body to the environment (Hahn *et al*., 1990; Jeffrey and Michael, 2010). Babayemi *et al*. (2014) reported that approximately 85% of heat loss is through the skin, while the

remainder is through the lungs, digestive and urinary secretions in cattle.

Pulse rate may be defined as the rhythmic or periodic thrust felt over an artery in time and rhythm with the heartbeat. The important factors to note in taking the pulse are: frequency, rhythm and quality (Hopster and Blokhuis, 1994 and Babayemi *et al*., 2014). Frequency is the number of heart beats occurring in one minute and is measured by the use of a stethescope and stopwatch. Rhythm typifies a normal pulse seen in a series of rhythmic beats that follow each other at regular intervals. Respiration is the act of breathing, or taking in oxygen, using it in the body tissues, and giving off carbon dioxide (Gaughan *et al*., 1999; Babayemi *et al*., 2014). The respiratory system is commonly subjected to primary and secondary disease, so stock owners must consider the area affected when an animal is not normal. Long lists of serious diseases that affect all classes of farm animals, eventually, spread and settle in areas of the respiratory system. Respiration consists of inspiration, or the expansion of the chest or thorax and expiration, or the expulsion of air from the lungs. Therefore, the objective of this experiment was to evaluate the effect of feeding varying levels of inorganic feed grade selenium and vitamin E supplementation on the thermoregulatory parameters of Friesian x Bunaji heifers.

MATERIALS AND METHODS

Study Location

The studies were conducted at the Dairy Research Programme farm of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika-Zaria, Nigeria. Shika is located in the Northern Guinea Savanna and lies on latitudes 11^0 06' 40" N and longitudes 7^0 43' 21"E at an elevation of 644m above sea level, with an annual maximum and minimum temperature of 31.0 ± 3.2 ^{0}C and 18.0 ± 3.7 ^{0}C, respectively. Shika has an average annual rainfall of 1100 mm, usually lasting from May to October with a mean relative humidity of 72 %. The dry season lasts from November to April with the mean daily temperature, ranging from 15 – 36 ^{0}C and mean relative humidity ranging from 20 – 37 % (IAR, 2017).

Experimental Design and Management of Animals

Twenty heifers weighing between 150 – 200kg were used for this study; the animals were grouped into four treatments with five animals per treatment. The animals were divided into four groups of five animals and the animals randomly assigned the treatments in a Completely Randomized Design (CRD). Treatment I served as the Control: no supplementation of either Selenium or Vitamin E. Treatment II was supplemented with 3 mg of feed grade Selenium. Treatment III was administered 20 mg of feed grade Vitamin E. Treatment IV received a combination of 3 mg feed grade Selenium and 20 mg of Vitamin E. The animals were fed the experimental diets weekly in the morning before grazing. The study last for a period of 120 days.

The animals were allowed to graze on free range pastures and supplemented with a concentrate diet consisting of 48 % Cotton Seed Cake, 13.7 % wheat bran, 35.3 % maize, 2 % bone meal, 1 % common salt; the diet comprised about 88 % dry matter, 15 % crude protein and 55 % total digestible nutrients. Water was provided *ad-libitum*. All the experimental animals were ear-tagged for ease of identification. The animals were dipped once a week during the dry season and twice a week during the wet season for effective control of ectoparasites.

Permission was obtained from the Committee on Animal Use and Care Ethics Committee, Ahmadu Bello University, Zaria (Reference ABUCAUC/2017/004).

Thermoregulatory parameters measurements

The parameters were measure in the morning between 7:00 a.m. and 8:00 a.m. The following parameters were measured monthly:

Respiratory Rate (RR):

This was determined by counting the number of flank movements per minute using a stop watch.

Rectal Temperature (RT):

This was measured on each animal using a digital thermometer. The sensory tip was disinfected and inserted into the rectum at the display of L °C (this indicated that the thermometer is set for temperature reading) and removed after the sound of the alarm signal. The displayed body temperature was then recorded.

Pulse Rate (PR):

This was determined by counting the number of contractions of the heart in one minute using a stethoscope (Model: BK002).

Statistical Analysis

Data generated were analyzed using the General Linear Model of SAS (2002). Significant means were compared using Dunnett (1964).

Model: $Y_{ij}=\mu + T_i + e_{ij}$

Where:

Y_{ij}=observation

μ=overall mean

T_i=fixed effect of the i^{th} treatment

e_{ij}=random error

RESULTS AND DISCUSSION

The results of effect of Se, Vitamin E and Se + Vitamin E supplementation on thermoregulatory parameters of heifers measured are shown on Table 1. The results depicted no significant ($p>0.05$) difference between the treatments within the first month of supplementation. There was no specific pattern for RR and RT measured except for PR which recorded a continuous decrease all through across the treatments. The result during the second month after supplementation showed significant ($p<0.05$) difference in RR and RT measured while PR showed no significant difference. The results for RR recorded were 30.00, 27.60, 26.80 and 25.40 for the control, Se, Vitamin E and Se + Vitamin E treatments respectively. While that of RT were 38.60, 39.32, 39.18 and 39.10 for the control, Se, Vitamin E and Se + Vitamin E treatments respectively. In the third month, there were no significant ($p>0.05$) difference in RR, RT and PR across treatments although RR was slightly lower in heifers supplemented with vitamin E or Se + Vit E than the control and Se treatments.

Thermoregulatory parameters could go a long way to in determining the health status of animals especially in the tropics where temperatures are high and could result to heat stress which could invariably affect production. The results for respiratory rate (25.60 – 28.80 breath/min), rectal temperature (38.82 – 38.94^0C) and pulse rate (72.80 – 75.80 beat/min) indicated similarity ($p>0.05$) within the first month of supplementation. The respiratory rate (25.60 – 28.80 breath/min) and rectal temperature (38.82 – 38.94^0C) observed in the present study were within the normal range as reported by Babayemi *et al*. (2014). During the second month after supplementation the result for RR was higher ($p<0.05$) in Friesian x Bunaji heifers under the control and Selenium treatments. Rectal temperature measured recorded higher ($p<0.05$) value with Se, vitamin E and Se + Vitamin E supplementation. Respiratory rate, rectal temperature and pulse rate measured after the third month were similar ($p>0.05$).

Table 1: Effect of Selenium, Vitamin E and Selenium + Vitamin E supplementation on thermoregulatory parameters of Friesian x Bunaji heifers during the three month period of supplementation

Parameter	Control	Se	Vit-E	Se + Vit-E	SEM	P-value
First month						
RR(breath/min)	26.80	28.80	25.60	27.40	1.53	0.5364
RT (^{0}C)	38.64	38.94	38.84	38.82	0.13	0.4496
PR (beat/min)	75.80	75.00	74.20	72.80	2.13	0.7832
Second month						
RR(breath/min)	30.00^{a}	27.60^{ab}	26.80^{b}	25.40^{b}	0.66	0.0014
RT (^{0}C)	38.60^{b}	39.32^{a}	39.18^{ab}	39.10^{ab}	0.15	0.0213
PR (beat/min)	76.00	76.20	75.20	74.80	2.29	0.9685
Third month						
RR(breath/min)	29.00	29.40	27.20	26.20	1.57	0.4510
RT (^{0}C)	38.48	38.48	38.74	38.42	0.16	0.5382
PR (beat/min)	74.00	74.20	70.60	75.20	2.06	0.3590

^{ab}Means within the same row having different superscript are significantly (P<0.05) different. RR-respiratory rate, RT-rectal temperature, PR-pulse rate, Se-Selenium, Vit-E-Vitamin E, SEM-Standard Error of Mean.

CONCLUSION

In conclusion, respiratory rate and rectal temperature were within the reference points for healthy cattle while pulse rate was slightly above the normal value in all the treatments and months. Although the values indicated that the animals were not under stress.

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