SHORT COMMUNICATION

Seasonal Variation in Rectal Temperature of Holstein Friesian Cattle in The Guinea Savanah Zone of Nigeria

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INTRODUCTION

When environmental temperature move out of the thermo neutral zone (comfort zone), dairy cattle begin to experience either heat stress or cold stress. In cold stress, the cow is required to increase the amount of energy used to maintain the body temperature and that means less energy available to produce milk. Thermo neutral zone is the range of environmental temperature where normal body temperature is maintained and heat production is at the basal level (Yousef, 1985). Heat stress for the dairy cow can be understood to indicate all high temperature related forces that induce adjustments occurring from the sub-cellular to the whole animal body to help the cow avoid physiological distinction and for it to better fit its environment (Kadzere et al., 2002).

Exposure of cattle to thermal stress leads to physiological responses such as the elevation of rectal temperature, respiratory rate and pulse rate with concomitant decline in feed intake and production. The components of the thermal environment which are involved in heat stress are temperature, humidity, wind speed, solar radiation and rainfall (Kabuga, 2005).

Dairy cattle produce milk more efficiently in environments where they can maintain their body temperature at around 38^{0}C (Stokka et al., 1998). Tissue and cellular metabolism and the underlying biochemical reactions that sustain life and production need narrow limits. Relatively small increases in body temperature of at least 1^{0}C result in detectable, deleterious effects in metabolism and tissue integrity, in particular, the breakdown of body protein and a significant depression in production (Smith and Mathewman, 2000). Heat stress is a result of an imbalance between heat gain and heat dissipation in an animal (Wayner, 2001). The primary factors that can cause heat stress in dairy cows are high environmental temperatures and high relative humidity (West, 1995).

Heat stress affects two of the most economically important segments of the dairy farm business, milk production and reproduction (Wayner, 2001). On the other hand, there is a reduction in feed intake associated with a decrease in milk production (Kabuga, 2005). To boost agriculture, increase animal protein production and alleviate poverty, private individuals and governments import exotic breeds of cattle. However, the anicipated benefits are not derived either due to diseases or environmental factors, of which temperature is one. The aim of this study was to evaluate the effects of variation in seasonal enviromental temperature on rectal temperatures of Holstein Fresian cattle imported to Nigeria for dairy production.

Key Words: Rectal temperature, season, Holstein Friesian, Savannah, Nigeria.

MATERIALS AND METHODS

The study was performed on Holstein Friesian cattle in Nagari farms located in the Northern Guinea Savanah zone of Nigeria. Rectal temperature of twenty Friesian cows were measured at 07.00hr and at 14.00hr using a digital thermometer after the animals had been accustomed to the experimental procedures for a period of 2 weeks. The animals were managed under semi intensive system. They were housed under a shed with concrete floor at night. Three to four years old lactating cows were used for the study. The animals were fed on established pasture (grasses and legumes), hay, silage and concentrates. All animals were apparently healthy at the time of experiment. The data was collected during cold and hot dry seasons respectively.

Temperature measurement was done daily for a period of 7 days. Data collected were subjected to analysis of variance using the appropriate sub-routine of SAS (1999) statistical packages. Means separation was

carried out using Least Significant Difference (LSD) method on the level P <0.0.5.

RESULTS

Data obtained from measurement of rectal temperature at 07.00hr and at 14.00hr using twenty Friesian cows are being presented (Tables I-III). Mean rectal temperatures, minimum and maximum together with standard errors are shown on table I and II. Mean morning temperature of 38.2^{0}C was recorded during cold and 38.87^{0}C in the hot dry season. Mean afternoon temperature of 38.8^{0}C was recorded during the cold season while 39.05^{0}C was obtained during the hot-dry season. They describe the extent of temperature fluctuation during the cold and hot-dry season respectively. The mean morning rectal temperature were 38.2 $\pm$ 0.3 and 38.87 $\pm$ 0.09 (P0.0<5) while the afternoon temperature were 38.8 $\pm$ 0.05 and 39.05 $\pm$ 0.05 (P <0.05) for the cold and hot-dry seasons respectively. In both seasons, mean 14.00hr temperature was significantly higher (P <0.05) than mean 07.00hr temperature.

Seasonal variation in rectal temperature was significant, being higher during the hot season than the cold season (Table III). Table IV shows the record weather conditions during the cold and hot seasons in the study area. This result describes the seasonal fluctuation in rectal temperature of a temperate breed of cattle, Holstein Friesian in the Nigerian Guinea Savanah zone of Nigeria.

TABLE I: Variations in rectal temperature of Holstein Friesian during the cold season (Mean + SE)

	Morning			Afternoon		
Day	Mean + SE	Min	Max	Mean + SE	Min	Max
1	38.63 + 0.09	38.20	39:10	38.70 + 0.07	38.40	39:20
2	38.63 + 0.11	38.00	39:10	38.49 + 0.13	38.70	39:20
3	38.68 + 0.09	38.30	39:20	38.55 + 0.08	38.20	39:10
4	38.54 + 0.05	38.20	38:80	38.63 + 0.08	38.20	39:10
5	38.67 + 0.16	38.90	39:80	38.79 + 0.16	38.10	39:90
6	38.66 + 0.08	38.30	39:10	38.76 + 0.07	38.40	39:10
7	38.67+ 0.08	38.30	39.10	38.76 + 0.09	38.40	39.20

TABLE II: Variations in rectal temperature of Holstein Friestian cattle during the hot-dry season (mean + SE)

	Morning			Afternoon		
Day	Mean + SE	Min	Max	Mean + SE	Min	Max
1	38.39 + 0.18	37.00	39:90	39.40 + 0.24	39.40	39:6
2	38.32 + 0.12	38.00	39:10	39.54 + 0.30	39.50	39:6
3	38.16 + 0.11	37.60	39:70	38.55 + 0.08	38.20	39:10
4	38.06 + 0.28	38.00	38:70	38.64 + 0.08	38.20	39:20
5	38.67 + 0.16	37.90	39:80	39.60 + 0.16	38.10	39:90
6	38.66 + 0.08	38.30	39:10	38.76 + 0.07	38.40	39:10
7	38.31 + 0.18	38.00	39:90	38.14 + 0.09	38.30	39:40

TABLE III: Effect of season on rectal temperature of Holstein Friesan

Time	Cold season			Hot-Dry Season		
	Mean	SD	SE	Mean	SD	SE
Morning	38.19b	1.55	0.13	38.87a	1.12	0.09
Afternoon	38.80b	0.56	0.05	38.05a	0.63	0.05

*Means within the same row bearing different superscripts differ significantly (P< 0.05).

TABLE IV: Mean relative humidity and ambient temperature during the study period.

Period	Rel. Humidity (%)	Min. temp (0C)	Max Temp (0C)
Cold (Dec-Feb)	53	21.5	36.5
Hot Dry Season (Mar.-Jun.)	54	26.5	39.8

Source: NIMET,(2001). Synoptic office Lafia, Nasarawa state.

DISCUSSION

The results of this study indicates that rectal temperature values of the Holstein Friesian cattle were within normal range established for the species (Radostits *et al.,* 2000). Distinct diurnal variation in rectal temperature was observed. Variations of rectal temperature with ambient temperature and hour of the day have earlier been reported in other species (Igono *et al.,* 1983, Ayo and Sinkelu, 2007). In both seasons, the mean afternoon (14.00hr) body temperature was significantly higher than early morning (07.00hr) temperatures. The mean temperatures were also significantly higher ($P<0.05$) during the hot dry season compared to the cold season. Meteorological data from the study area indicated higher ambient temperatures during the hot dry season (NIMET). The findings of this research are in agreement with earlier reports that rectal temperature is an indicator of thermal balance and may be used to assess the adversity of the thermal environment (McDowell *et al*., 1976).

Ambient temperatures in the study area, particularly during the hot-dry season are outside the thermo neutral zone (18-28^{0}C) for the dairy cattle (Aceves *et al*., 1987). The animals are therefore required to increase the amount of energy used to maintain body temperature and there is less energy available to produce milk. Under such conditions milk yield and quality are adversely affected. The findings of this research highlight the need for farmers importing exotic dairy breeds to adapt management practices that ameliorate the effect of heat stress particular during the hot season. It is suggested that thermal stress be alleviated by use of shade in addition to sprinkler and fan cooling systems.

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