

The effect of environment on reproductive performance of dairy cattle in South Western Nigeria.

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Abstract

The effect of environment on the reproductive performance of 50 Holstein cows at the Iwo Road Dairy Farm of Oyo State, Nigeria, was evaluated by summarising and analysing data collected on the cows over a seven year period (January 1970 to December 1976). Two main seasons were discernible from the rainfall and temperature data:

- (i) the dry season with a mean rainfall of 36mm and mean maximum and minimum temperatures of 31.6°C and 22.3°C respectively, and
- (ii) the wet season with a mean rainfall of 176 mm and mean maximum and minimum temperatures of 29.8°C and 22.7°C respectively.

These seasonal variations adversely affected reproductive performance. Data collected for the dry and wet seasons respectively were: services per conception, 3.7 and 2.5; number of conceptions, 35 and 121; first oestrus after calving, 61 and 50 days from first service to conception, 64 and 52; and number of calves born, 53 and 91.

Introduction

Several studies (Stott, 1961; Stott and Williams, 1962; Ortavant, 1973 and Courot *et al*, 1968) have illustrated that continuously high ambient temperatures influence the reproductive performance of cattle. Severe thermal stress may cause a cessation of oestrus and even ovulation in cattle and sheep. A less dramatic but nevertheless major contributor to lowered fertility, is the shortening of the duration of visible oestrus caused by high ambient temperatures (Pleasant *et al*, 1970). In areas where the mean daily temperatures exceed 24°C for several months in the year as in southwestern Nigeria, some decline in breeding efficiency is inevitable in dairy herds, particularly among exotic breeds of cattle. The combination of high ambient temperatures and low rainfall also affect the composition of pasture, whose quality rapidly declines during the dry season (McDowell, 1972). The problem is compounded by a reduction in feed intake by cows under heat stress.

It has been reported that lactating cows exhibit some depression in appetite at 25°C, show marked decline above 30°C and virtually stop eating at 40°C (Johnson, 1967).

This paper reports observations made on the influence of seasonal variations in temperature and rainfall on the reproductive performance of 50 Holstein cows, over a seven year period, at the Iwo Road Dairy Farm at Ibadan in Oyo State of Nigeria.

Materials and Methods

The records of 50 Holstein cows kept at the Iwo Road Dairy Farm between January 1970 and December 1976 were used in this study. The farm is located in southwestern Nigeria where the dry season lasts from November to March and the rainy season, from April to October.

The cows were housed in barns at night and let out into pasture during the day. A mixture of brewers' grains and maize fortified with vitamins augmented the diet of the grazing animals. The cows were checked daily for heat in the barns with fertile bulls before they were let out in the morning, and also when they returned in the evening. All cows in heat were mated to Holstein bulls. Heifers were bred at between eighteen and 24 months of age. Calves were weaned at six months of age. All cows were given adequate veterinary care for protection against common parasites and diseases during the period. Records examined included daily maximum and minimum temperatures, breeding dates, calving and weaning dates. The data collected over the seven year period was combined and summarised by months. The year was then divided into two seasons corresponding roughly to the high temperature and low rainfall months of the year referred to in this study as the dry season, and the low temperature, high rainfall months which constitute the wet season. The student t-test was used to analyse the data (Steel and Torrie, 1960).

Results and Discussion

The warmest months of the year were between November and March. The mean seven year monthly maximum and minimum temperatures are presented in Table 1. The mean maximum and minimum temperatures for the dry and wet seasons were 31.6°C, 22.3°C and 29.9°C, 22.7°C respectively. The mean maximum temperature for the dry season therefore exceeded 30°C at which dairy cows have been

shown to exhibit marked decline in appetite. The mean rainfall distribution is presented in Fig. 1. The highest rainfall closely approximated the coolest months of the year. The mean rainfall for the dry and wet seasons were 36mm and 176mm respectively.

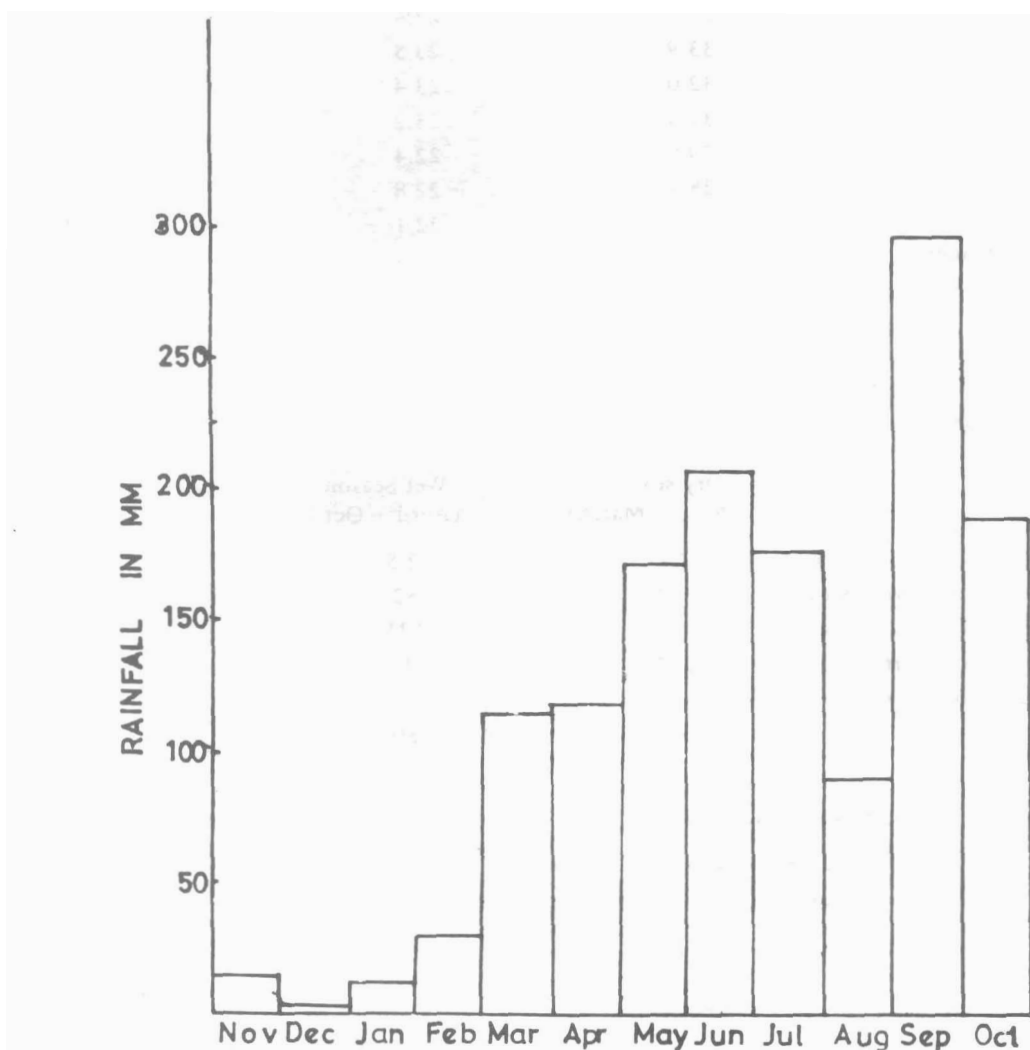


Fig. 1: Mean monthly rainfall at Iwo Road Dairy Farm for the period 1970-1976.

TABLE 1: MEAN MONTHLY MAXIMUM AND MINIMUM TEMPERATURES
(1970-1976) AT THE IWO ROAD DAIRY FARM.

	<i>Maximum Temperature °C</i>	<i>Minimum Temperature °C</i>
November	33.2	22.8
December	33.5	21.3
January	33.1	20.9
February	35.1	23.4
March	33.9	23.5
April	32.0	23.4
May	31.5	23.2
June	30.0	22.4
July	28.4	22.8
August	27.0	22.1
September	27.1	22.5
October	31.1	22.7

TABLE 2: INFLUENCE OF SEASON ON FERTILITY

	Dry season (Nov. — March)	Wet Season (April — Oct.)
Services per conception ¹	3.7	2.5
Length of service period ¹	64*	52
Number of conceptions ²	35*	121
Number of births ²	53*	91
Days from calving to ¹ first estrus	61*	50

¹Mean for seven years

²Total for seven years

*P = .005

The influence of season on reproductive efficiency is presented in Table 2. More services were required per conception between November and March than between April and October. The optimum number of services per conception is one per pregnancy. Well managed herds have been registered to average 1.3 to 1.6 services per conception (McDowell, 1972). Although the difference in the number of services per conception between the two seasons was not significant, the difference is reflected in the number of days from first service to conception or length of service period which was longer ($P < .05$) during the dry season. There were more conceptions ($P < .05$) during the wet season. In contrast to this, the highest frequency for conception for 17,000 Zebu cows with year-round breeding in Tanzania, was found to be during the hottest months of October and November (Wilson, 1967). This may be a breed difference but it is difficult to explain why cows would conceive more during the hottest period of the year. Other authors (Stott and Williams, 1962; Dunlap and Vincent, 1967) support the reasoning here that cattle respond with poor reproductive performance to increasingly higher ambient temperatures. It has been demonstrated that the feed intake of lactating Jerseys, Brown Swiss and Holstein cows was depressed at 27°C (Ragsdale *et al.*, 1950 and 1951). The mean maximum temperature during the day for the dry season months was never below 30°C (Table 1). The adverse seasonal effect of high ambient temperatures and low rainfall is not only reflected in the amount of feed consumed but also in the quality of the feed. It is evident therefore that reduced intake in response to heat stress coupled with the direct influence of heat on the cows, will lower reproductive performance. There was also a lengthening of the number of days from calving to first oestrous during the dry season. It took the Holstein cows longer ($P < .05$) (an average of 11 days more) to show the first signs of heat after parturition (Table 2). A higher number of conceptions and birth were recorded for the wet season. These measures of reproductive performance are influenced by nutrition as well as ambient temperatures. It has become increasingly clear that post partum infertility is an anestrus which may be induced by the action of undernutrition and lactation, and that the two factors are probably related (Synnington, 1969). Severe thermal stress in conjunction with undernutrition during the dry season may be responsible for the differences between the seasons. Over the seven year period, 144 calves were born to the 50 holstein cows. This amounts to 14% calf crop. The largest number (91) of calf birth was obtained during the wet season.

Conclusion

Under the conditions prevailing in southwestern Nigeria, the optimum time for breeding appears to be between May and September. Furthermore, it seems that the influence of adverse environmental conditions was greater at conception than during pregnancy because even cows bred during the late wet season successfully carried their pregnancy to term. However, before a more conclusive statement can be made about wet season breeding in this area, a more detailed study of the cows under the varying natural environments should be made.

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