

Full Length Research Paper

# A study of the effects of season, breed and grazing location on lactation yield in a tropical wet-and-dry climate of Nigeria

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The interactive effects of season, breed and grazing location on cattle milk lactation were evaluated in 2013. The study was carried out using milk yield data from the grazing land of the University of Agriculture, Abeokuta rural extension area and Rounda cattle base. The experiment was a 2x2x3 factorial arrangement of two cattle breeds (Yakana and Dage), two locations (Alabata and Rounda) and three seasons (dry, establishment and early humid periods). The general model for selecting the lactation period was  $0.1PE < P < 0.5PE$  following Cocheme and Franquion (1967) method. This was partitioned into dry, establishment and early humid, respectively as  $P \leq 0.5PE$ ,  $0.5PE \leq P \leq PE$ ,  $P \geq 0.5PE$ . The treatment was subjected to analysis of variance (ANOVA). The result shows that there was no significant interaction ( $P=0.15$ ) between the cattle breeds and the grazing location, cattle breed and season ( $P=0.23$ ) and location and season ( $P=0.48$ ) on the cattle lactation yield. It was also observed that the breeds have a greater lactation yield during the dry season for both cattle (Yakana and Dage) and locations (Alabata and Rounda). Finally, there were no significant interaction ( $P=0.78$ ) in cattle breed, location and season on the lactation yield. Dry season cattle milk lactation improved yield for both selected locations and breeds, hence it is recommended in the study area.

**Key words:** Climatic parameters, milk production, cattle, Yakana and Dage.

## INTRODUCTION

Dairy cows are very sensitive to climatic variations that greatly influence their welfare and their ability to produce milk in the tropics as in other part of the world (Payne and Wilson, 1999; Tekerli et al., 2000; Johnson et al., 2002). In particular, climate has both direct and indirect effect on milk production. The direct effect is manifested by the effect of climatic factor on other component of animal environment (Ehoche et al., 2001). Climate determines the prevalence and extent of internal and external

parasites, the feed supply and grazing location. The grasses which are mostly annuals, are nutritious at the beginning of the rains but with the onset of dry season, there is rapid decline in nutrient contents especially nitrogen and phosphorus (Ehoche et al., 2001). At this time, the low quality of natural pastures and the inefficient use of fibrous crop residues result in inadequate feeding of the stock with adverse implications on reproductive efficiency and milk production as feed nutrients become inadequate to support the potential yield of the animals (Preston and Leng, 1984; Adamu et al., 1993). Cattle breeds have been shown to affect yielding capacity due to sensitiveness to heat stress (West, 2003). Milk yields

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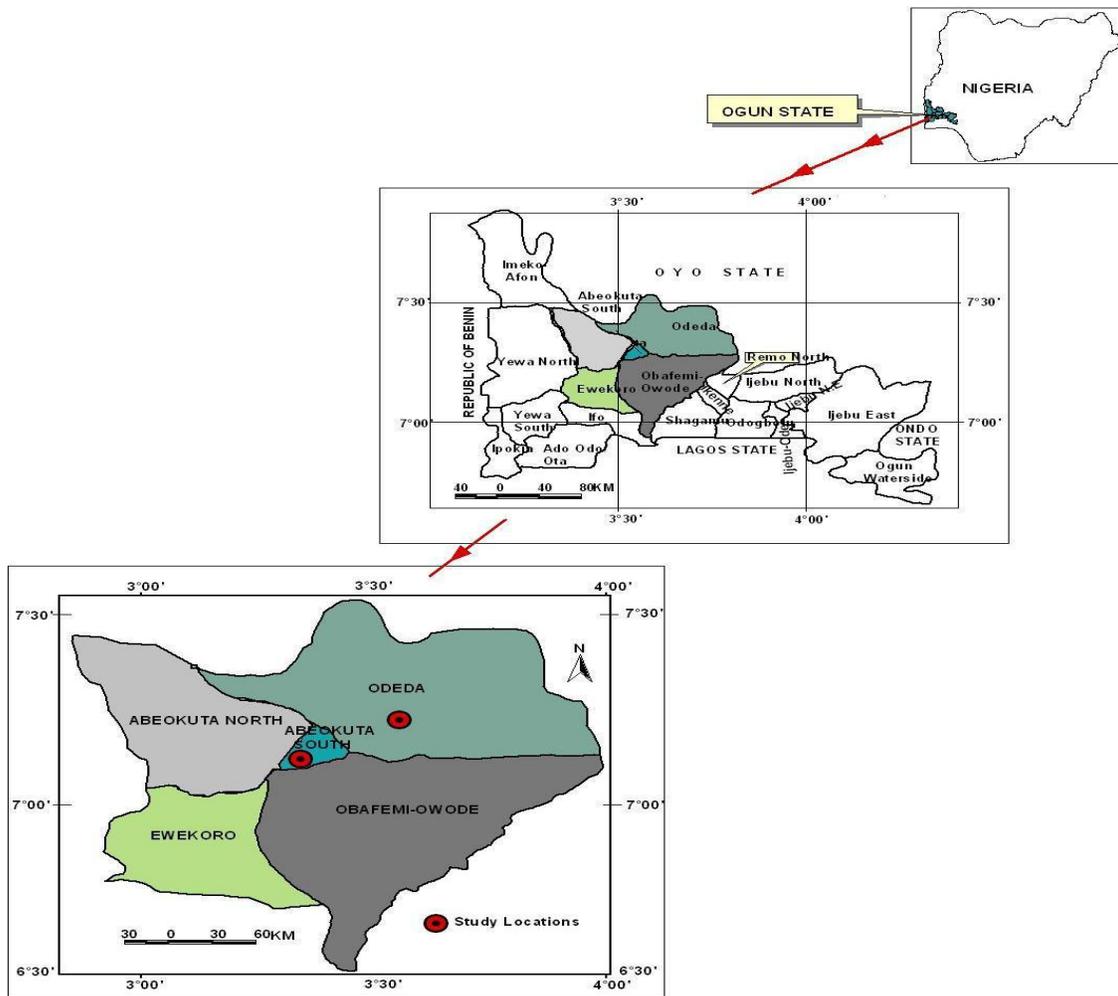


Figure 1. Map showing the study area in Abeokuta, Ogun State, Southwestern Nigeria.

of Jerseys and Holsteins from some temperate region have been shown to be affected by the total environmental complex by Johnson, 1987b. Furthermore, location of cattle breeding also influences milk production. A decline in milk yields for Holsteins or Jerseys in a temperate climate as compared to the tropics was shown to be very great. Several researchers have demonstrated that uncontrolled breeding leads to seasonal uniform calving (Menendez et al., 1978; Pena and Plasse, 1971; Butterworth, 1983). This study, therefore, intends to investigate the interactive effects of season, breed and grazing location on cattle milk lactation yield in southwestern Nigeria

**MATERIALS AND METHODS**

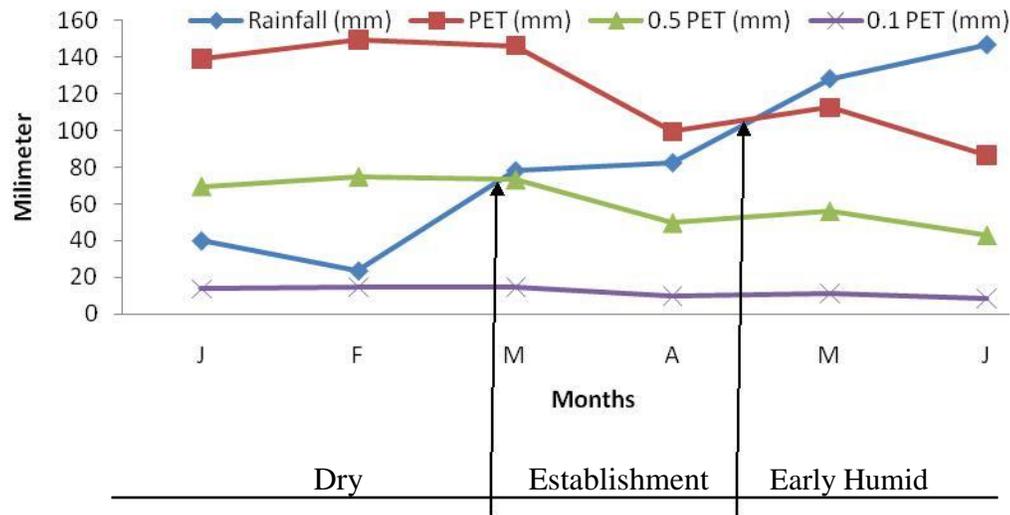
**Description of study area**

The research was conducted at the agro-pastoral settlement in the peri-urban areas of Abeokuta (7° 15'N,

3°25'E) lying within a circle of a maximum of 25 km radius from the outskirts of the specified urban centre (Mohammed, 1990). The study area is characterized by a tropical climate with distinct wet and dry seasons and bimodal rainfall pattern with annual range of 1,500 - 2,000 mm and air temperature which ranged from 22 - 34°C. The wet season lasts for 8.0 - 8.5 months starting from mid-March to mid-November. The relative humidity is lowest (35-55%) at the peak of dry season in February and highest (75-85%) at the peak of rainy season starting from June through September (Bernabucci, 2002). The soil at the experimental sites was categorized as a well-drained tropical ferruginous soil. The A horizon of the soil is an Oxic Paleudulf of the Iwo series with 83% sand, 5% silt and 12 % clay with a pH of 6 (Olasantan, 2007) Figure 1.

**Experimental design and field measurement**

Milk production in the study area is based on indigenous



**Figure 2.** Graph of rainfall – potential evapotranspiration used for classification of seasons during the experimental year.

Yakana and Dage cattle breed herded to the fields in the morning after milking in order to graze natural forages and crop residues. Two grazing location (Alabata and Rounda) were selected based on the closeness to the Federal University of Agriculture Rural Extension area. Cows were milked once a day in the morning, the remainder of the milk being suckled by the calves. Milking commenced a week after calving to allow calves access to colostrum. Yield data collection commenced two weeks after calving and continued throughout lactation. The lactation period marked the time dams dried up or calves were naturally weaned as practiced under traditional systems of management in the study area. The daily milk off-take (THAT IS, extractible milk for human consumption) record was taken daily, in a one litre measuring cylinder. Hand milking was done in the morning between 0700 to 0800 h local time, while calves were used to initiate milk let-down. Partial milking was done in order to reserve milk for sucking calves which were then prevented from sucking the dams while on the time range by means of a Fulani apparatus called “Toide” that was placed around the calves’ neck. During milking period, daily observation of rainfall (mm) and evapotranspiration (mm) data were used to categorize the lactation periods into dry season, establishment of rain and the early humid period. These seasons were classified following potential evapotranspiration (P-PE) model according to Cocheme and Fraquin (1967). For instance, the period  $P < 0.5PE$  is taken as the dry season ( $S_1$ ), period  $0.5PE \leq P \leq PE$  as the establishment period ( $S_2$ ) and  $P < 0.5PE$  as the humid period ( $S_3$ ). This is shown in Figure 2.

Data collected were subjected to analysis of variance (ANOVA) to evaluate the effect of season, location, cattle breeds and their interaction on the respond variable

(lactation yield). The significant difference of treatment mean was determined using least significant difference (LSD) at 5% probability level.

## RESULTS AND DISCUSSION

The interactive effect of cattle breeds, grazing location and season on the cattle lactation yield is shown in Table 1. The result shows that there was no significant interaction ( $P=0.15$ ) between the cattle breeds and grazing location. It was observed that the mean lactation yield for the different breeds and locations is 124.8 L. Furthermore, there was no significant difference ( $P=0.23$ ) in cattle breed and season. However, it was observed that the breeds have a greater lactation yield in the dry season than both the establishment and early humid period.

Furthermore, the result revealed that cattle in the establishment and early humid period had close range of lactation yield. Lactation yield of cattle during the dry season had an average yield of 165.60 L, 115.20 L during the establishment period and 93.40 L for the early humid period. This implies that the lactation yield in the dry season is 30 L higher than both the establishment and early humid period. The highest milk yield as obtained during the dry season actually contradict the finding of Epaphras et al. (2004) on effect of season and parity on lactation of crossbred Ayrshire cows reared under coastal tropical climate in Tanzania; this could be as a result of the difference in the breed and area of study. The interactive effect of location and season on the cattle lactation yield shows that there were no significant interaction ( $P=0.48$ ) in both. It was also observed that the breeds had a greater lactation yield during the dry season than both the establishment and early humid period in the selected locations.

**Table 1.** Interactive effect of cattle breed, location and season on cattle lactation yield.

Treatment breeds x location	Lactation yield	Treatment breeds x seasons	Lactation yield	Treatment Location x season	Lactation yield	Treatment Breed x location x season	Lactation yield
Dage x Alabata	138.10 <sup>a</sup>	Yakana x S <sub>1</sub>	176.56 <sup>a</sup>	Alabata x S <sub>1</sub>	176.33 <sup>a</sup>	Yakana x Rounda x S <sub>1</sub>	182.05a
Yakana x Rounda	131.03 <sup>a</sup>	Dage x S <sub>1</sub>	154.63 <sup>ab</sup>	Rounda x S <sub>1</sub>	154.86 <sup>ab</sup>	Dage x Alabata x S <sub>1</sub>	181.60a
Yakana x Alabata	118.07 <sup>a</sup>	Dage x S <sub>2</sub>	122.14 <sup>bc</sup>	Alabata x S <sub>2</sub>	112.92 <sup>bc</sup>	Yakana x Alabata x S <sub>1</sub>	171.07ab
Dage x Rounda	111.66 <sup>a</sup>	Yakana x S <sub>3</sub>	108.27 <sup>bc</sup>	Rounda x S <sub>3</sub>	111.14 <sup>bc</sup>	Dage x Alabata x S <sub>2</sub>	138.00abc
Prob. level	0.15	Dage x S <sub>3</sub>	97.88 <sup>c</sup>	Rounda x S <sub>2</sub>	98.04 <sup>c</sup>	Dage x Rounda x S <sub>1</sub>	127.67abc
		Yakana x S <sub>2</sub>	88.82 <sup>c</sup>	Alabata x S <sub>3</sub>	95.00 <sup>c</sup>	Yakana x Rounda x S <sub>3</sub>	121.23abc
		Prob. Level	0.23	Prob. Level	P=0.48	Dage x Rounda x S <sub>2</sub>	106.28c
						Dage x Rounda x S <sub>3</sub>	101.05c
						Yakana x Alabata x S <sub>3</sub>	95.30c
						Dage x Alabata x S <sub>3</sub>	94.70c
						Yakana x Rounda x S <sub>2</sub>	89.80c
						Yakana x Alabata x S <sub>2</sub>	87.83c
						Prob. Level	P=0.78

Mean with the same letter are not significantly different (P<0.05).

Finally, there were no significant interaction (P=0.78) in cattle breed, location and season on the lactation yield as observed in Table 1.

## CONCLUSION AND RECOMMENDATION

From this study, it is obvious that there were no significant effect of cattle breed and location on cattle milk production. Moreover, no significant interaction was observed between cattle breed x location, cattle breed x season, location x season and cattle breed x season x location. All the treatment responded in the same way to lactation milk yield thus factorial effect were generally not statistically significant. Dry season cattle milk lactation improved yield for both selected locations and breeds, hence it is recommended in the study area.

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