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Effects of Genotype, Birth Weight and Season of Birth on Some Reproductive Traits in Friesian Cows and Their First Cross

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Abstract
The study was carried out to assess the effects of genotype, birth weight and season on lactation yield, age at first calving and calving interval on Friesian and Friesian x White Fulani cross from data collected from West African milk company-integrated dairy farm, Vom, Jos, Plateau state. Records from 130 Friesian and 129 Friesian x White Fulani cows that had three lactations were used for the study. The data were subjected to analysis of variance using SAS package and the means, where significant, were separated using the Least Significant Difference (LSD). There was a significant effect ($p<0.05$) of genotype, season of birth and birth weight on lactation yield, but not for age at 1st calving. Season of birth also had influence ($p<0.05$) on 2nd calving interval but not on age at 1st calving. Friesian had the shortest age at 1st calving, higher lactation yield and longer calving intervals. Heaviest calves at birth had the highest lactation yield and longer calving intervals.

Keywords: Genotype, birth weight, reproductive traits, Friesian, cows

Introduction

Reproduction in livestock is very crucial for production of necessary replacement stock, for reducing of unproductive period, for initiation of lactation, for increasing life time milk production and income (Das *et al*., 1986). When reproductive efficiency of a farm is poor, losses that may occur include fewer calves being born due to longer calving interval, increased veterinary cost due to more problematic cows and increased in number of mating to achieve conception as a result of poor heat detection (Mwatawala and Kifaro, 2009). Genotype can be said to be the major factor that influence milk production in cows. However, variation in reproductive traits in animals could vary due to differences in strains /genotype (Morales *et al.,* 1989), management and nutrition (Chase *et al*., 1979) as well as other factors that determine the performance of cattle. Many factors have been reported in the literature to influence reproductive traits in cattle. However, there is a dearth of information on traits measured in early life on future reproductive performance in cows.

Therefore, the objective of study was to assess the effects of genotype, season of birth and birth weight on milk yield, calving interval and age at first calving in Friesian and Friesian-White Fulani first cross.

Materials and Methods

The data for the study were obtained from West African Milk Company (WAMCO) Integrated dairy farm, Vom-Jos, Plateau state. Vom is situated at an elevation of 1200 m above sea level and lies on latitude 8°45' East and longitude 9°43' North in the guinea savannah of north central Nigeria. The average annual rainfall ranges from 1300 mm – 1500 mm, peaking in July/August with a decline from late August. Mean monthly minimum and maximum ambient temperatures are 13.9°C and 31.1°C, respectively while the relative humidity at noon ranges from 14 – 74% (Encarta, 2007).The husbandry system on the farm is intensive and rotational grazing is practiced in the rainy season while hay and silage with concentrate were the major feed during the dry season. Reproductive records used for the purpose of this study include: birth weight, birth date, age at first calving, lactation length, lactation yield and calving interval.

The data obtained were analyzed for variance using the general linear model of the SAS (1991) package and the means, where significant, were separated using the Least Significant Difference (LSD).

Results and Discussion

Effect of genotype: There was significant effect of genotype ($p<0.05$) on age at first calving (Table 1). The result shows that the crossbreds had longest age at 1st calving while pure Friesian had the shortest. Age at 1st calving obtained for Friesian-White Fulani in the present study is lower than those reported at Shika (Buvanendran *et al.,* 1981) and Vom (Dettmers and Laseinde-Olotu, 1978) in Nigeria, respectively. The result of age at 1st calving obtained in this study for the Friesian cows is higher than those reported for Friesian in Sudan (Abuzaid, 1999) and in the temperate region (Zaeid, 1995). This slight Variation in age at first calving could probably be due to

differences in strains of the Friesian (Morales *et al.,* 1989), management and nutrition and other climatic factors. The average age at 1st calving of the Friesian x White Fulani crossbred obtained in this study is similar to earlier reports for similar genotype in the same environment (Sohae,l 1984).

Table 1: Least square means ± SE of effects of genotype on age at first calving (days), lactation yield (kg) and calvingInterval (days)

Factor	AFC ***	1st LY ***	1st CI *	2nd LY ***	2nd CI **	3rd LY ***
Overall	30.32±0.36	5637.14±292.25	370.57±7.40	5667.17±289.56	362.05±62.15	4895.68±290.49
Friesian	29.11±0.55^{b}	6743.26±417.55^{a}	376.67±5.08^{a}	7038.81±395.52^{a}	406.73±28.41^{a}	6517.08±518.65^{a}
Friesian x White Fulani	31.45±0.35^{a}	4607.31±307.70^{b}	364.90±7.22^{b}	4390.14±248.95^{b}	344.50±6.02^{b}	4142.89±247.70^{b}

a, b, c, d= means within the same column bearing different superscripts are statistically significant.,*** = p<0.001, ** = p<0.01 * = p< 0.05 NS = Not significant., AFC = Age at first calving, LY = Lactation yield., CI = Calving interval

The result of 1st, 2nd and 3rd lactation yields of the two genotypes are presented in Table 1. The yields of obtained for Friesian in this study are higher than the range of 2042-6557 Kg for Friesian cattle kept under subtropical conditions (Usman *et al*., 2012). The result of 1st, 2nd and 3rd lactation yields obtained for Friesian-White Fulani is much higher than the range of 1715-2339 kg reported by Malau-Aduli *et al.* (1996). The variation could probably be due to differences in management and weather condition. The result of 1st and 2nd calving intervals for Friesian in this study is lower than 463.6 days (Mwatawala and Kifaro, 2009) but higher than the 385.7 days obtained for Friesian in Cameroun (Gwaza *et al*., 2007). The result of calving intervals of Friesian-White Fulani crossbred in this study is lower than 390 days for Friesian-White Fulani (Malau-Aduli *et al*., 1996). The slight difference between the 1st and 2nd calving intervals show that as the animalgrows older calving interval also reduce.

Effect of season: The effect of season of birth on reproductive traits of Friesian and Friesian-White Fulani cows presented in Table 2 shows no significant effect (p>0.05) of age at 1st calving. Similar trend was reported by Hayatnagarkar *et al.* (1990) and Malau-Aduli *et al.* (1996). Season of birth however significantly affect (p<0.05) lactation yield. Cows that were calved during the late rainy and early dry seasons had the highest 1st lactation yield (p<0.001) followed by those calved in late dry season and lastly, early rainy season. Similar trend was reported by Mukasa *et al.* (1992).This is probably due to the fact that during late dry season, the animals under study were usually fed hay, silage and concentrates thereby boosting their milk potentials. Non-significant effect of season of birth on calving interval was recorded. The result is similar to those of Malau-Aduli *et al.* (1996) in Friesian-White Fulani and Das *et al.* (1990) in Jersey cows.

Table 2: Least square means ± SE of effects of season on age at first calving (days), lactation yield (kg) and calving interval (days) of Friesian and Friesian-White Fulani cows

Factor	AFC NS	1st LY ***	1st CI NS	2nd LY *	2nd CI NS	3rd LY *
Overall	30.33±0.37	5541.72±298.76	370.25±7.82	5645.26±300.11	356.91±19.25	4955.44±298.14
Early rainy season	30.37±0.48	4252.95±371.05^{c}	369.10±14.84	4616.60±380.14^{c}	351.92±11.31	3820.00±356.03^{d}
Late rainy season	30.00 ± 1.22	7650.25±1356.45^{a}	329.25±12.55	6104.00±751.30^{b}	366.33±12.86	5961.83±677.58^{b}
Early dry season	28.50±1.02	7664.00±598.18^{a}	403.50±24.20	6956.83±891.67^{a}	332.50±34.61	6516.25±1048.19^{a}
Late dry season	30.52±0.64	5742.04±402.34^{b}	369.70±10.04	6119.57±497.21^{b}	376.88±18.22	5205.11±448.65^{c}

a, b, c, d= means within the same column bearing different superscripts are statistically significant.,*** = p<0.001, ** = p<0.01 * = p< 0.05 NS = Not significant., AFC = Age at first calving, LY = Lactation yield., CI = Calving interval

Effect of birth weight: Birth weight of cows significantly affect age at first calving (p<0.05). Table 3 shows that cows with birth weight between 40-46 kg had low age at 1st calving and lactation yield when compared to those with ≤25-36 kg birth weight. This shows that the higher the birth weights the lower the age at 1st calving. The above results confirm earlier assertions that heavier cows have good production performance than lighter cows

(Linden *et al*., 2009; Ghoraishy and Rokouei, 2013).This result is the similar throughout 2nd and 3rd lactations. Therefore, the higher the birth weight the higher the lactation yield. Weight at birth did not affect (p>0.05) 1st calving interval but significantly affected (p<0.05) 2nd calving interval.

Table 3: Least square means ± SE of effects of birth weight on age at first calving (days), lactation yield (kg) and calving interval (days) of Friesian and Friesian-White Fulani cattle

Factor	AFC **	1st LY *	1st CI NS	2nd LY **	2nd CI ***	3rd LY **
Overall	30.39±0.36	5531.87±293.34	370.19±7.69	5613.93±296.16	397.02±31.06	4890.35±297.79
≤ 25 kg	30.00±0.00^{a}	5119.00675.00^{c}	334.00±6.00	4654.50±385.50^{b}	390.50±37.50^{b}	4453.06±819.00^{b}
26 - 32 kg	31.50±0.43^{a}	4965.97±353.40^{c}	366.03±11.72	4742.60±325.02^{b}	338.46±6.54^{c}	4297.89±303.27^{b}
33 - 39 kg	29.10±0.78^{a}	5729.90±762.46^{b}	385.70±16.38	6806.30±778.46^{a}	425.60±43.33^{a}	6418.50±935.14^{a}
40 - 46 kg	28.75±0.78^{b}	6850.42±634.71^{a}	373.67±12.10	6958.50±575.75^{a}	433.50±36.85^{a}	6430.80±723.47^{a}

a, b, c, d= means within the same column bearing different superscripts are statistically significant.,*** = p < 0.001, ** = p<0.01 * = p< 0.05 NS = Not significant., AFC = Age at first calving, LY = Lactation yield., CI = Calving interval

This signifies that there is no relationship between weight at birth and 1st calving interval, but probably at subsequent intervals. Heaviest cows at birth (40-46 kg) had the highest calving interval when compared to those of 26-32 kg. Therefore, the higher the birth weight, the higher the calving interval and *vice versa.* The heavier the birth weight, the lesser the age at 1st calving but the higher the 1st, 2nd and 3rd lactation yields and the higher the weight at birth, the lesser the 2nd calving interval. The above results confirmed that heavier cows had better reproductive performance than lighter cows as reported by Ghoraishy and Rokouei (2013).

Conclusion and Recommendations

Friesian cows had shortest age at first calving, 1st calving interval and highest lactation yields while crossbred had shortest 2nd calving interval. Season of birth had no effect on the attainment of age at first calving. Cows that were calved during the late rainy and early dry seasons had the highest 1st lactation yields while those with the highest yield tend to have a relatively shorter age at 1st calving. The heavier the birth weight, the lesser the age at 1st calving but the higher the 1st, 2nd and 3rd lactation yields and the higher the weight at birth, the lesser the 2nd calving interval. Selection should be focused on calves with higher weight at birth and breeding should target favorable season of parturition.

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