PRODUCTION CHARACTERISTICS OF $F_1$ FRIESIAN X BUNAJI CATTLE IN VOM

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Abstract

A total of 141 lactation records from $70 F_1$ Friesian $\delta \times$ Bunaji $\varphi$ cattle maintained at the National Veterinary Research Institute's dairy farm, Vom, from 1970 – 1975 was utilized. Measurements were made of milk production traits of economic importance. Average milk yield was 1694 kg in 258 days. Mean 305 – day yield was 1896 kg. The third and fourth lactations were superior to the first and second ($P < 0.05$). Differences in lactation lengths were small ($P > 0.05$). Peak production occurred at the fourth lactation when animals were 67 months old. Age at first calving averaged 29.7 months. Mean dry period and calving intervals were 64 and 331 days respectively. First calvers were non-significantly more persistent than older cows ($P > 0.05$). Management practices essential for increased milk production and shorter calving intervals were suggested.

Key Words: Friesian, Bunaji, crosses lactation

Introduction

The performance of Friesian and other European – type dairy cattle in tropical and sub-tropical areas, has been studied extensively (Rice, 1965; Adeneye and Adebanso, 1978; Alberro, 1980, 1983). The general observation is that the European – type dairy cattle do not yield as much milk in the tropics as in the temperate countries. This has been attributed to several factors among which are stress caused by heat and solar radiation, often compounded by concurrent high humidity levels, infestation with external and internal parasites, subclinical diseases, poor quality roughage rations, nutritional deficiencies and a generally low level of livestock management.

The increase milk production in Nigeria has been attempted by the introduction of European stock of improved genotype to cross with the best available local breed, generally the White Fulani (Bunaji) zebu cattle. The

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resultant crosses usually show increased resistance inherited from the local breed, but suffer a partial diminution of the high production traits of the improved European stock (Mason, 1974). Experiments at Shika, Vom and Agege have shown that the $F_1$ Friesian x White Fulani crosses improved considerably in milk production over their White Fulani dams (Foster, 1960, Schurman, 1965, Knudsen and Sohael, 1970). When the level of Friesian blood was increased to 75 percent, milk production was further increased without adversely affecting reproduction and calf mortality (Buwanendran and Nuru, 1981). However, the beneficial heterosis effects most prominent in the $F_1$ generations gradually diminish.

There is a dearth of information on the dairy characteristics of $F_1$ Friesian $\delta$ x Bunaji $\varphi$ cattle in Nigeria. This paper is an attempt to shed more light on the dairy traits such as milk yield, lactation length, dry period, age at calving and calving intervals of this cross-bred with a view to improving their performance.

**MATERIALS AND METHODS**

**Environment**

The study was carried out from January 1970 to December 1975 at the National Veterinary Research Institute's dairy farm, Vom, Nigeria. Vom is a village about 24 km to Jos capital of Plateau State. It is situated at an elevation of 1280m above sea-level and lies 8°45' East and 9° 43' North. The average annual precipitation ranges from 1300 to 1500mm. The rainfall extends from late March to early October with peak periods in July and August. The mean monthly minimum and maximum temperatures are 13.9°C and 31.1°C respectively while the mean relative humidity at noon varies from 14 to 74 per cent. Vom is relatively free from trypanosomiasis and tsetse fly menace.

The greater part of the farm is divided into paddocks ranging in size from 1.2 to 10 hectares. Among the prominent natural grasses and legumes are *Cynodon nlemfuensis*, *Chloris gayana* *Hyparrhenia rufa* and *Stylosanthes gracilis*. The paddocks are dotted at the periphery by shade trees.

**Animals and Management**

The herd studied consisted of 70 $F_1$ Friesian $\delta$ x Bunaji $\varphi$ heifers. These animals were the progeny of a cross-breeding programme which commenced in 1965 with three pure-bred Friesian bulls imported from Britain and the local White Fulani cattle. A total of 141 completed lactations was analysed. The data on milk yield and lactation lengths were obtained from the production records of these animals while age at calving, the dry periods and calving intervals were calculated.

The animals were rotationally grazed in paddocks in the wet season (April to September). During the dry season (October to March), maize silage and hay in addition to concentrate were offered free-choice. A production ration consisting of 65% maize, 20% groundnut cake, 15% cotton seed cake and a proprietary vitamin and mineral (added at the rate of 5.0kg per ton of feed) was fed to each animal at the rate of 1.0kg per 2.5kg milk yield in two equal instalments in the morning (0600 hr) and afternoon (1600 hr) machine milkings. The allowances were adjusted weekly on the basis of the average daily milk production of each animal recorded in the preceding week. Mineral salt-lick was
provided throughout the year. The animals were sprayed weekly against ectoparasites and dewormed every four months. Routine inoculations were carried out against brucellosis, anthrax, balckquarter, rinderpest, contagious bovine pleuropneumonia and haemorrhagic septicaemia. The animals remained outdoors in paddocks night and day except for milking and extra feeding. However, all calvings were as much as possible done in individual stalls in the barn. Calves were allowed to suckle their dams for the first 3—4 days after parturition and were then bucket-fed herd milk. Lactating cows were dried off as soon as the weekly yield dropped below 14 to 16 kg and as far as possible each cow was given a rest period of 6 to 8 weeks between lactations.

The data were subjected to analysis of variance (Steel and Torrie, 1960), while comparison between means was done by Duncan’s (1955) Multiple Range Test.

RESULTS

Season of Calving
A total of 141 normal parturitions among the 70 cross-breds was recorded. Calving occurred in all the months of the year. The frequency of calving was higher during the dry season (56.3%) than in the wet season. During the periods: January—March, April—June, July—September, and October—December of 1970—1975, 25.8, 21.2, 22.5 and 30.5 percent of the calvings respectively were recorded.

Age at Calving
The average age at first calving was 29.7 ± 0.34 months (table 1). The coefficients of variation in age at calving were 7.8, 10.2, 8.4 and 8.0 percent from first through fourth parturitions. The differences were not significant (P > 0.05).

Milk Yield and Lactation Length
Average milk yield in four lactations was 1694 kg in 358 days. The first calvers averaged 1636 kg in 293 days, which was less (P < 0.05) than 1722 kg yielded by the cows in 242 days. Maximum milk yield was attained in the fourth lactation. There were no significant differences between the lactation lengths. The third and fourth lactation milk yields were significantly higher (P < 0.05) and of shorter duration (P > 0.05) than either the first or second. Similar trend was observed in the daily yields in higher (P < 0.05) than that of the first and second but not the third (P > 0.05). The second lactation 305-day yield was superior to the first (P < 0.05). The average milk yield of the best ten animals ranged from 2218 kg in 285 days in the second to 2587 kg in 283 days in the fourth lactation (Table 2). Maximum 305-day milk yield of the best ten was also attained in the fourth lactation. The third and fourth 305-day yields were similar but higher (P < 0.05) than the first and second yields. The latter two lactation 305-day yields, were similar.

Persistency of Milk Production
The persistency of milk production in the first four lactations is shown in Table 3. Persistency during each lactation was computed as:

\[
persistency = \frac{\text{Monthly milk yield} \times 100}{\text{Previous month's yield}}
\]

The mean persistency ranged from 89 percent in the fourth to 95 percent in the first lactation. The persistencies tended to decrease with parity. The mean persistency for all the lactations was 93 percent.
Table 1
Production traits among F₁ x Bunaji (zebu) cows in Vom (1970–1975)

Lactation order

<table>
<thead>
<tr>
<th>Trait</th>
<th>1 (n=47)</th>
<th>2 (n=36)</th>
<th>3 (n=29)</th>
<th>4 (n=29)</th>
<th>2-4 (n=94)</th>
<th>All lactations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at calving (month)</td>
<td>29.7</td>
<td>42.5</td>
<td>53.5</td>
<td>67.3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>X</td>
<td>29.7</td>
<td>42.5</td>
<td>53.5</td>
<td>67.3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>SE</td>
<td>0.34</td>
<td>0.72</td>
<td>0.85</td>
<td>1.00</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Actual milk yield (kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>1635.5a</td>
<td>1648.0a</td>
<td>1820.0b</td>
<td>1848.0b</td>
<td>1721.6c</td>
<td>1694.0</td>
</tr>
<tr>
<td>SE</td>
<td>10.0</td>
<td>10.9</td>
<td>10.9</td>
<td>5.8</td>
<td>5.8</td>
<td>5.6</td>
</tr>
<tr>
<td>Daily milk yield (kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>5.5a</td>
<td>6.6b</td>
<td>7.8c</td>
<td>7.5c</td>
<td>7.2c</td>
<td>7.55</td>
</tr>
<tr>
<td>SE</td>
<td>0.21</td>
<td>0.35</td>
<td>0.36</td>
<td>0.30</td>
<td>0.20</td>
<td>0.16</td>
</tr>
<tr>
<td>305-day month yield (kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>1623.7a</td>
<td>1855.6b</td>
<td>2171.7c</td>
<td>2133.3c</td>
<td>2038.0c</td>
<td>1896.0</td>
</tr>
<tr>
<td>SE</td>
<td>73.1</td>
<td>70.8</td>
<td>113.3</td>
<td>122.6</td>
<td>55.6</td>
<td>47.1</td>
</tr>
<tr>
<td>305-day month yield (kg/day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>5.40</td>
<td>7.50</td>
<td>9.07</td>
<td>9.24</td>
<td>8.5</td>
<td>7.55</td>
</tr>
<tr>
<td>SE</td>
<td>0.21</td>
<td>0.38</td>
<td>0.44</td>
<td>0.40</td>
<td>0.25</td>
<td>1</td>
</tr>
<tr>
<td>Dry period (days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>61.4</td>
<td>65.9</td>
<td>64.3</td>
<td>62.0</td>
<td>64.4</td>
<td>63.5</td>
</tr>
<tr>
<td>SE</td>
<td>6.50</td>
<td>4.50</td>
<td>6.5</td>
<td>4.9</td>
<td>3.0</td>
<td>2.81</td>
</tr>
<tr>
<td>Calving interval (days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>348.8</td>
<td>334.2</td>
<td>319.2</td>
<td>319.6</td>
<td>325.5</td>
<td>331.3</td>
</tr>
<tr>
<td>SE</td>
<td>5.7</td>
<td>6.0</td>
<td>4.5</td>
<td>3.8</td>
<td>3.15</td>
<td>2.94</td>
</tr>
</tbody>
</table>

n = Number of observations; X = Mean; SE = Standard error of mean
a,b,c = Means followed by different letters along each row are significantly different (P<0.05).
Table 2


<table>
<thead>
<tr>
<th>Trait</th>
<th>1st lactation Mean CV</th>
<th>2nd lactation Mean CV</th>
<th>3rd lactation Mean CV</th>
<th>4th lactation Mean CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual milk yield (kg)</td>
<td>2508.9 17.3</td>
<td>2217.8 8.7</td>
<td>2541.6 24.2</td>
<td>2586.6 15.8</td>
</tr>
<tr>
<td>Lactation length (days)</td>
<td>362.4&lt;sup&gt;a&lt;/sup&gt; 14.9</td>
<td>285.3&lt;sup&gt;b&lt;/sup&gt; 10.0</td>
<td>277.3&lt;sup&gt;b&lt;/sup&gt; 8.9</td>
<td>283.2&lt;sup&gt;b&lt;/sup&gt; 5.6</td>
</tr>
<tr>
<td>Daily Milk yield (kg)</td>
<td>6.9&lt;sup&gt;a&lt;/sup&gt; 8.6</td>
<td>7.9&lt;sup&gt;b&lt;/sup&gt; 15.4</td>
<td>9.2&lt;sup&gt;c&lt;/sup&gt; 25.2</td>
<td>9.1&lt;sup&gt;c&lt;/sup&gt; 13.6</td>
</tr>
<tr>
<td>305–day milk yield (kg)</td>
<td>2273.0&lt;sup&gt;a&lt;/sup&gt; 12.3</td>
<td>2329.6&lt;sup&gt;a&lt;/sup&gt; 12.6</td>
<td>2681.6&lt;sup&gt;b&lt;/sup&gt; 24.6</td>
<td>2690.4&lt;sup&gt;b&lt;/sup&gt; 13.8</td>
</tr>
<tr>
<td>305–day milk yield/day (kg)</td>
<td>6.3&lt;sup&gt;a&lt;/sup&gt; 11.5</td>
<td>8.3&lt;sup&gt;b&lt;/sup&gt; 22.0</td>
<td>9.8&lt;sup&gt;c&lt;/sup&gt; 29.1</td>
<td>9.7&lt;sup&gt;c&lt;/sup&gt; 13.9</td>
</tr>
</tbody>
</table>

CV = Coefficient of variation (percent)

a,b,c Means along row the same with similar superscript are not significant (P>0.05).

Table 3:

PERSISTENCY OF MILK PRODUCTION OF F₁ FRIESIAN X BUNAJI CATTLE IN VOM (1970–1975)

<table>
<thead>
<tr>
<th>Lactation No.</th>
<th>No. of Observations</th>
<th>Mean Persistency %</th>
<th>Coefficient of Variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>47</td>
<td>95.2</td>
<td>6.6</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>93.9</td>
<td>6.2</td>
</tr>
<tr>
<td>3</td>
<td>29</td>
<td>92.9</td>
<td>4.8</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>89.2</td>
<td>9.1</td>
</tr>
<tr>
<td>Total or Mean</td>
<td>141</td>
<td>92.8</td>
<td>6.9</td>
</tr>
</tbody>
</table>
Fig. 1: Lactation Curves of $F_1$ Friesian X White Fulani Cattle.
Lactation Curve

The first four lactation curves are shown in Fig 1. Maximum milk production was reached in the fifth week of the first and second lactations and in the fourth week in the subsequent two lactations. The average maximum weekly yield was 55, 65, 74 and 77 kg for the first, second, third and fourth lactations respectively. Thereafter milk yield decreased at variable rates as the week of lactation progressed except in the fourth lactation curve, where a prominent increase in daily milk yield was observed between the 40th and 45th week.

Dry Period

An average of 64 days of dry period was recorded. The mean dry period increased from 61.4 days in the first lactation to 66 days in the second lactation and then decreased with the lactational sequence. However, the differences between lactations were not significant. The coefficient of variation was of fairly high degree when compared with those of the other traits.

Calving Interval

The intercalving periods are shown in Table 1. The overall calving interval was 331 days. This trait showed a decreasing trend with increase in age of the animals. However, the differences in the mean lactation lengths were not significant.

DISCUSSION

The present F_1 Friesian x Bunaji heifers and the F_1 Friesian x zebu cattle in Ethiopia (Alberro, 1983) apparently calved at similar age. Earlier report (Knudsen and Sohael, 1970) indicated that F_1 Friesian x White Fulani heifers produced their first calves two and a half months later, whilst their counterparts in Mozambique were longer by 6.3 months (Alberro, 1980). Early calving may indicate early maturity and therefore longer productive life (Edgerly, 1971).

The present actual and 305-day milk yields (Table 1) were more than the values reported (Alberro, 1980, 1983) for the cross-bred in Ethiopia. However, the present values were comparable with those of Knudsen and Sohael (1970). The absence of pasture especially legumes in the paddocks during the dry season and the irregular supplementary feeding were likely to result in sub-optimal level of nutrition with consequent reduction in milk production of these animals. Also, at various times during 1970-1975 period, the animals were hand-milked for a number of days due to power failures. Thus, much time was spent during milking and less at grazing, resulting in less forage consumption, which might probably have adversely affected milk production. In addition, those animals which suffered from diseases such as mastitis and streptothricosis yield less milk during the periods of infection as the records indicated. The extent of reduction in yield depended on the duration and severity of the attack. The rise in the incidence of streptothricosis in the farm especially during the wet season, has been pointed out elsewhere (Ibeawuchi et al, 1983).

The actual and mature 305-day milk yields of the third and fourth lactations were significantly higher (P<0.05) than those of the first and second. The cows were superior to the first calvers in actual and 305-day milk yields by 5.2 and 24.9 percent respectively (Table 1). Other workers (Bodisco et al, 1971; Ibeawuchi, 1984) reported similar observations. It was also observed that the heifer dams
showed greater variations in milk yield and lactation length which tend to indicate that the cows were better adapted and exhibited increased maturity.

The performance of the selected ten best animals (Table 2) is an indication that significant improvement in milk production could be achieved through selection and breeding. The 305 - day milk yields were 2273, 2330, 2682 and 2690kg from first through fourth lactations.

The mean persistency values (Table 3) tended to decrease with increase in the order of lactation. Thus, first calvers were more persistent than older cows. The differences were however, not significant. Similar observations were made by Ullah (1952) and Ibeawuchi (1984). However, Mahadevan (1951) reported that Ayrshire cattle dropped from the first to the second, but henceforth increased progressively with age.

The lactation curves (Fig. 1) clearly show that the third and fourth lactations were superior to the first and second. The curves also tend to suggest that under Vom conditions, it would not be economically reasonable to cull the animals before their fourth lactations as a result of low milk production.

The present average calving interval (331 days) was better than that reported for their counterparts in Ethiopia (Alberro, 1983). The second and third calving intervals were 15 and 30 days shorter than the first. This is in agreement with various reports in other breeds (Wilson and Willis, 1974, Phillips, 1974, Adeneye and Adebanjo, 1977).

The average of 64 days of dry period (Table 1) compared favourably with 57 to 67 days dry period reported for Holstein-Friesian (Shaeffer and Henderson, 1972), but shorter by 28 days for Holstein-Friesian cattle in India (Bhat et al., 1978).

From the results reported in the study it seems conclusive that with a fair degree of management, it is possible to improve on the milk production of this cross-bred. The dry periods and calving intervals can further be reduced through improved nutrition, better veterinary care and other management practices. Importance of supplementary feeding especially during the dry season should not be over-looked. Animals on heat should be served 30 to 60 days after parturition in order to reduce the calving intervals.

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REFERENCES


