AHMED (F.A.), BABIKER (B.A.), MOHAMED (T.M.), ALI (T.E.). Amélioration génétique par croisement entre la race Kenana (bétail zébu du Soudan) et la race Frisone européenne : effet sur la performance des veaux, la production laitière et la composition du lait. Revue Élev. Méd. vét. Pays trop., 1992, 45 (3-4) : 329-333

The effect of genetic upgrading of Kenana (Sudan zebu cattle) with European Friesian on calf performance, milk yield and milk composition

INTRODUCTION

It is now a widely accepted practice in many countries in the tropics to upgrade the indigenous dairy cattle by crossing with exotic temperate breeds to improve the productivity of the former. In these countries much information has been gathered and published on the performance of the crossbreds regarding parameters like milk yield, lactation length, age at first calving and calving interval (3, 10, 14, 19, 31). Amongst the other important traits in dairy cattle are viability and milk composition. In a recent review on crossbreeding Bos indicus and Bos taurus for milk production in the tropics, CUNNINGHAM and SYRSTAD (9) indicated that records on such parameters have rarely been reported.

The Kenana cattle is a subtype of the Northern Sudan Shorthorn Zebu (Bos indicus) introduced many centuries ago with migrants from Asia (6, 17). They are generally considered to have resulted from interbreeding with Sanqa cattle and Shorthorn Zebu (25). The average milk yield of large herds has been reported to be 1 500 kg/lactation (8). Mature cows may be 130 cm high at shoulder and weigh up to 450 kg. They are light blue grey with a yellowish grey horn and weigh up to 450 kg. They are light blue grey with a yellowish grey horn and weigh up to 450 kg.

MATERIALS AND METHODS

Two experiments were carried out at the University of Gezira Farm (latitude 14°30', longitude 33°39') during the years 1985 to 1987. Experiment I was carried out during the period of January 1985 to March 1986. The average temperature and humidity during this period was 31 °C and 42.5 %, respectively. Experiment II was carried out during the period January to March 1987, the average temperature and humidity during this period was 31 °C and 42.5 %, respectively. In experiment I, Friesian x Kenana crossbred calves were used to study the effect of genotype on feed intake, liveweight gain and feed conversion efficiency by calves up to the age of 26 weeks. In experiment II, milk yield and composition (fat and protein) were studied in Friesian x Kenana crossbred cows.

Experiment I

Animals and management

Sixty four Friesian x Kenana crossbred calves were used of which 32 were 50 % Friesian, 50 % Kenana and 32 were 75 % Friesian, 25 % Kenana crosses.
After delivery, the calves were weighed and transferred to individual feeding pens where they received colostrum by nipple pail feeding system within, at most, one hour. The quantity of colostrum offered in the first 4-6 h was about 10 % of the calves' birthweight. Colostrum feeding continued for 48 h. The calves were then bucket-fed from their mothers' milk for the following five days after which they received farm milk till weaning. The daily amount of milk was given in two equal portions, one in the morning and one in the evening. The calves were weaned at ages of 6, 8, 10 and 12 weeks. Starter concentrate rations composed of cottonseed meal, groundnut meal, wheat bran, molasses, oyster shell and common salt providing 175 g/kg DM of crude protein and 11.4 MJ/kg DM metabolizable energy (ME) were introduced to the calves at the end of their first week of age and continued till weaning. During the post-weaning period, the calves were reared collectively in group pens. Supplement rations composed of the same dietary ingredients as those used for the starter rations were used. However, the diet provided a crude protein content of 155 g/kg DM and 11.3 MJ/kg DM (ME). Table I shows the ingredients and their chemical composition (starter and supplement feeds). Forage sorghum (Sorghum vulgare var. Abu70) was offered to the calves. The forage was daily cut in the preblooming stage and offered fresh and green. The daily feed intake and fortnightly liveweight were recorded. This period continued till the age of 26 weeks. All calves were vaccinated against rinderpest, blackquarter, hemorrhagic septicaemia and anthrax. They were sprayed weekly with an acaricide against ticks.

Experiment II

Animals and management

Fourteen milking cows were used in this experiment. Ten cows were 50 % Friesian, 50 % Kenana while the other four were 75 % Friesian, 25 % Kenana. All the cows were in their third lactation and were hand-milked twice daily at 03:00 and 13:00 h. Milking was initiated by offering the concentrate diet and was carried out at the milking parlour. The animals were kept in a spacious shaded pen. The cows were let to graze from 09:00 to 12:00 h. Grazing was on swards of Ræseem (Trifolium alexandrium L.) and Clitoria (Clitoria ternatea). In addition to grazing, a concentrate ration composed of wheat bran (530 g/kg), groundnut meal (350 g/kg), molasses (100 g/kg), mineral and vitamin supplements (20 g/kg), providing 250 g/kg DM crude protein was offered. The quantity of concentrate per cow was calculated according to its milk production. Individual milk yields were recorded. The experimental period lasted 75 days.

Chemical analysis

The chemical composition of the feeds was determined by proximate analysis according to the standard methods adopted by the A.O.A.C. (4).

An aliquot sample of milk was taken from each cow in the morning every three days, during the whole period of the experiment. The milk samples were analysed for fat and protein (N x 6.38) by the standard Gerber’s and formaldehyde reaction methods, respectively.

Statistical analysis

The data in experiment I were analysed by analysis of variance using Duncan’s Multiple Range Test according to STEEL and TORRIE (30). T-Test was used for the analysis of the data in experiment II according to SNEDECOR and COCHRAN (29).

RESULTS

The effect of genotype (75 and 50 % Friesian Zebu crosses) on feed consumption and performance of the crossbred calves during the whole experimental period is shown in table II. During the preweaning period (0-12 weeks) the dry matter intake which included that of milk, supplement and forage, although it was slightly higher for the 75 % Friesian group showed no significant difference between the two genotypes. However, the 75 % Friesian genotype showed a significantly (P < 0.001) higher liveweight gain than the 50 % Friesian group. On the other hand, the feed conversion ratio was significantly (P < 0.01) higher for 50 % than for 75 % Friesian crosses. During the postweaning period (12-26 weeks), there was no significant difference in dry matter intake between both genotypes. The 50 % Friesian group of calves showed a significantly (P < 0.001) higher liveweight gain than the 75 % Friesian group. Feed conversion ratio was signifi-
cantly (P < 0.01) higher and favourably (P < 0.001) lower for 50% than for 75% Friesian crosses, during the preweaning and postweaning periods respectively.

The mean values of milk yield, fat and protein for both groups of genotypes are shown in table III. The 50% Friesian group produced a significantly (P < 0.001) higher milk yield than the 75% Friesian group. On the other hand, the fat and protein content of their milk was significantly (P < 0.001) lower than that of the 75% Friesian group.

DISCUSSION

The results of this study show a significant effect of the genotype on the growth of calves over both the preweaning and postweaning period. BHAT et al. (5) reported that in Friesian Zebu crosses the genotype had a significant effect on body weight at all ages. In the study reported here, 75% Friesian calves showed a significantly higher growth in the preweaning period than the 50% crosses. PLANAS PEREZ (23) reported that growth rate was higher up to 12 weeks for the 75% Friesian than for others. When considering the growth of the calves over the whole period of study (26 weeks) 50% Friesian calves had a significantly higher growth than 75% Friesian calves. Perhaps with time the 75% Friesian became less able to withstand climatic conditions and less able to use the available feed as efficiently as the 50% Friesian. Long ago, HOWE (11) reported that the slow growth rate of purebred Holstein calves in the tropics was due to the inability of such breeds to withstand the climatic conditions and the restriction of feed due to the inability of such animals to metabolize properly, at high temperatures, enough feed for normal existence. Other workers (22, 32) stated that the superiority of halfbred over 3/4 foreign blood animals was due to their high hybrid vigour. The results of this study is in agreement with the findings of RATHORE (24) who reported that 50% Friesian, 50% Zebu had faster growth than 75% Friesian, 25% Zebu. Also our results confirm the findings of ALRAWI and SAID (2) who found that daily gain decreases as the percentage of the Friesian blood increases. In this study the feed conversion efficiency was found to be significantly better for 50% than for 75% Friesian crosses in the postweaning period (12-26 weeks) and over the total period.

The results of this study show that 50% Friesian crosses cows produced a significantly higher milk yield than 75% Friesian crosses. This agrees with what had been reported by NARAYANASWAMY (21) when he compared Friesian-Sahiwal crosses (1/2, 5/8 and 3/4 Friesian) and found that the superiority of the total milk yield was in the order of half Friesian > 5/8 Friesian > 3/4 Friesian. ALBA and KENNEDY (1) showed that the F1 (Criollo x Jersey) crosses were superior to the Criollo breed and 1/4 Jersey. In India SHARMA et al (28) found that with 1/8, 1/4, 1/2, 5/8 and 3/4 Friesian blood, the average milk yield was higher for 1/2 Friesian than for the other groups. KALE et al (12) in their studies with different grades of Holstein-Friesian by Gir and Sahiwal crosses concluded that there was no advantage in increasing the Holstein-Friesian inheritance beyond 50%. The same conclusion was reached earlier by NAIR (20) when crossing Zebu cattle with Brown Swiss.

TABLE II The effect of genotype on the average drymatter intake, average liveweight gain and feed conversion ratio of Friesian x Kenana crossbred calves during preweaning (0-12 weeks) and postweaning (12-26 weeks) period.

| Genotype        | S.E. and level of significance |
|-----------------|-------------------------------|
| Drymatter intake (kg/head/day) |                                |
| Preweaning      | 0.84                          | 0.037 NS                       |
| Postweaning     | 1.95                          | 0.052 NS                       |
| (kg/100 kg LW/day) |                                |
| Preweaning      | 1.56                          | 0.127 NS                       |
| Postweaning     | 1.90                          | 0.074 NS                       |
| Liveweight gain (kg/head/day) |                                |
| Preweaning      | 0.28                          | 0.072***                      |
| Postweaning     | 0.50                          | 0.036***                      |
| Feed conversion ratio |                                |
| Preweaning      | 2.94                          | 0.001**                       |
| Postweaning     | 3.89                          | 0.001**                       |

S.E. : Standard error.
NS : Non significant.
**: Significant at P < 0.01 ; *** : Significant at P < 0.001

TABLE III The effect of genotype on the average milk yield, milk fat and milk protein of Friesian x Kenana crossbred cows (means + S.D.).

| Genotype        | Genotype        | T-test Level of significance |
|-----------------|-----------------|-----------------------------|
| Milk yield (l/cow/day) | 11.01 + 0.399 | 9.20 + 0.726 ***          |
| Milk fat (g/kg)   | 42.0 + 2.14    | 45.9 + 3.81 ***           |
| Milk protein (g/kg) | 31.0 + 1.60   | 32.6 + 2.06 ***           |

S.D. : Standard deviation.
*** : Significant at P < 0.001.
In Kenya, MEYN and WILKINS (18), analysing data on a farm of Jersey and Jersey x Sahiwal showed that the crosses produced 16 % more milk than the purebreds. With Ayrshire and Sahiwal x Ayrshire crosses KIMENYE and RUSSEL (13) reported higher milk yield for the 50 and 75 % Ayrshire than for the high-grade Ayrshire and they concluded that a "fair portion of Bos indicus genes is desirable in this environment". In the coastal region of Tanzania, MAHADEVAN and HUTCHINSON (16) comparing a range of crossbreds of Bos indicus and Bos taurus showed that the 50 % Bos taurus cross had slightly higher milk yield than the 25 and 75 % crosses. The records collected from Northern Nigeria involving White Fulani and Friesian were analysed by BUVANENDRAN et al. (7) and they showed that the milk yield in all lactations of the 50 % crosses of the two breeds exceeded the 75 % Friesian crosses by 100 % (287 kg vs 143 kg). On the other hand, the milk yield in the first and second lactation of Ndama and Jersey crosses in the Ivory Coast was higher for 75 % than for 50 % crosses Jersey crosses (15).

Although the 75 % cross benefit regarding milk production levels was clearly visible after the second lactation, the lack of resistance of these crosses towards the wet tropical environment made no progress beyond the 50 % cross with the Ndama x Jersey cattle and numerous health problems occurred from the third lactation (15).

It was shown that over the 26-week study period, the growth of 50 % Friesian crosses was significantly faster than that of 75 % Friesian calves. It was also shown that 50 % Friesian crosses exhibited a significantly higher milk yield but a lower milk protein and milk fat content than the 75 % Friesian cows. Hence, under the conditions of this study the 50 % Friesian crosses seemed to perform better than the 75 % crosses. These results indicate that future upgrading plans should be carefully and cautiously monitored.

CONCLUSION

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AHMED (F.A.), BABIKER (B.A.), MOHAMED (T.M.), ALI (T.E.).
Efecto del cruce de ganado Kenana (ganado cebú de Sudán) para el mejoramiento genético del desarrollo de los terneros y de la producción y composición de leche. Revue Elev. Méd. vét. Pays trop., 1992, 45 (3-4) : 329-333

Two experiments were undertaken with Friesian x Kenana crosses to study the effect of 25 and 75 % upgraded indigenous cattle on calf performance, milk yield and milk composition. In experiment I, the dry matter intake, liveweight gain and food conversion ratio of preweaned and postweaned calves were studied. There was no significant difference in dry matter intake between both genotype groups. Liveweight was significantly higher for 75 % than for 50 % Friesian crosses during the preweaning period while it was significantly higher for 50 % than for 75 % crosses during the postweaning period. Food conversion ratio was higher for 50 % than for 75 % crosses during the preweaning period while it was higher for 75 % than for 50 % crosses during the postweaning period. In experiment II, 50 % crossbred cows produced significantly more milk than 75 % crosses but their milk composition was lower in fat and protein concentration. Generally, the results indicate a better performance of the 50 % upgraded genotype. Future upgrading plans should be carefully monitored. Key words : Friesian x Kenana cattle - Crossbreeding - Calf - Weaning - Growth - Milk yield - Milk - Fat content - Protein content - The Sudan.

Both milk fat and milk protein were significantly higher for 75 % than for 50 % Friesian cows. SHARMA et al. (27) in their studies with Brown Swiss and Zebu crosses report that the yield of fat significantly decreased in the F1 compared to the F2 generations.
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