THE INFLUENCE OF BREED OF CALF ON THE MILK PRODUCTION OF BEEF COWS

A. M. NICOL
Lincoln College, Canterbury

SUMMARY

With reference to the 135-day solids-corrected milk yields of 20 beef cows in two consecutive years in which they were randomly allocated to two bull groups, it is shown that those cows suckling Friesian × Angus calves produced 82 kg or 9.5% more milk than those suckling calves sired by an Angus bull. This difference could be due to the difference between the two groups of calves in terms of their suckling behaviour and to a possible *in utero* effect. There was no difference between the two groups of calves in the regression of calf gain on milk production. For each additional 100 l of milk, calf gain increased by 5.6 kg.

INTRODUCTION

IT IS generally accepted that the milk production of dairy cows can be increased somewhat by milking more frequently (Dodd, 1957) and that very incomplete milking (Schmidt *et al.*, 1964) can reduce milk yield. Moore (1966) has shown that the genotype of the suckling lamb can influence the milk production of the ewe. The effect of varying suckling frequency and the time spent suckling by beef calves on the milk production of beef cows has not been studied in detail.

Nicol and Sharafeldin (1975) reported a slight increase in suckling frequency and time per suckle, resulting in a significantly greater total suckling time for Friesian × Angus calves compared with Angus calves. They hypothesized that the additional suckling time might have induced a higher lactation performance in those cows suckling the Friesian × Angus calves.

This paper reports further on the effect of the breed of calf on the milk production of beef cows and considers the conversion ratio of milk to calf gain of the two groups.

ANIMALS AND METHODS

The beef cows used in this study were those described by Nicol and Sharafeldin (1975), namely, Angus and Angus-cross cows suckling calves sired by either a Friesian or an Angus bull.

The lactation performance of 20 cows was available for two consecutive years in which the cows had been randomly allocated to the two bull breeds for mating.

The milk production of all cows was measured at approximately 3-weekly intervals by the technique described by Lamond *et al.* (1969). Milk composition was determined by standard analytical techniques.

Daily milk yields were corrected to Solids Corrected Milk (SCM) using the formula given by Tyrrell and Reid (1965) where:

$$\text{SCM (kg)} = M\ (F \times 0.123 + SNF \times 0.0656 - 0.075)$$

when M = daily milk yield (kg)
F = fat percentage of milk
SNF = solids-not-fat percentage

Daily SCM yields were accumulated to give 135-day lactation yields. Simple additive corrective factors for sex of calf, year and plane of cow nutrition were calculated from the data and applied to the 135-day SCM yields before the final comparison between Friesian × Angus and Angus. In addition, some further analyses were undertaken of the behaviour data presented previously.

Cows and calves were weighed regularly between birth and weaning.

RESULTS AND DISCUSSION

135-DAY SCM YIELDS

On the basis of the 40 available 135-day SCM lactations, cows suckling Friesian × Angus (F × A) calves produced 944 kg SCM as opposed to 862 kg for those with Angus calves, a difference of 9.5%. Moore (1966) reported a 7% increase in milk yield (g/h) when Merino ewes were suckled by Corriedale compared with Merino lambs. This difference was due to a greater milk production not to a significant change in milk composition (Table 1).

The increased suckling frequency (SF) of the F × A calves of 3.8 times versus 3.4 reported by Nicol and Sharafeldin (1975) is small compared with an increase in the number of milkings from 2 to 3 times per day which increases the milk yield of dairy cows on average by 6% (Hanssen and Bonnier, 1947). In this work increased SF is unlikely to be the entire cause of the increased milk production.

TABLE 1: MILK COMPOSITION AND TOTAL 135-DAY YIELD OF CONSTITUENTS OF COWS SUCKLING F × A OR ANGUS CALVES

	Calf Type	
	Angus	*Friesian × Angus*
135-day SCM yield (kg)	862	944
Composition of milk (%):		
Fat	4.20	4.26
Protein	3.37	3.42
SNF	9.36	9.56
TS	13.62	13.72
Total 135-day yield (kg):		
Fat	36.2	40.2
Protein	29.0	32.3
SNF	80.7	90.2
TS	117	130

Total Suckling Time and Milk Production

Using only the lactation figures (24) for which corresponding behaviour data are available, a low non-significant negative correlation was shown between total suckling time (TST) and 135-day SCM yield. The greater total suckling time of the F × A calves must, therefore, reflect either a slower rate of milk removal, which is difficult to support in view of the greater milk production of the cows suckling F × A calves, or a greater persistence of suckling leading to a better emptying of the udder and possible consequent stimulation of milk production.

Although the whole area of the relative importance of milk removal and stimulation of lactation is still not fully determined, it is likely that a combination of the increased suckling frequency and persistence of suckling contributed to the greater milk production of the cows suckling the F × A calves .

Effect of Sire of Calf on the Milk Production of the Cow

Recent dairy research work (Skjervold and Fimland, 1975) suggests that the foetus may influence the milk production of its dam, through hormone activity of the foetal placenta on mammary development during pregnancy. Such an effect could, therefore, be contributing to the differences in milk production observed between the two groups of cows in this work. This effect is likely to be small compared with the post-natal effects discussed above.

Relationship Between Birth Weight and Milk Production

While there is a positive correlation of 0.58 between calf birth weight and milk production, similar to that of Neville (1962) which would explain some of the differences between the two groups of cows, it is unlikely to explain the full effect since there is no significant correlation in these data between birth weight and total suckling time which is more a function of breed type.

Calf Liveweight Gain and Milk Conversion Ratio

Table 2 shows the birth weights, weaning weights and daily liveweight gains of the two groups of calves, together with the apparent milk conversion ratio (MCR) which was calculated by dividing the 135-day SCM milk yield by the total liveweight gain of the calf between birth and 135 days. The birth weight, gain and 135-day weights of the two groups of calves were significantly different but there was no significant difference in the average MCR.

TABLE 2: THE PERFORMANCE OF CALVES SIRED BY FRIESIAN AND ANGUS BULLS SUCKLING BEEF COWS

	Calf Type	
	Angus	*Friesian × Angus*
Birth weight (kg)	24.0	30.0**
135-day weight (kg)	141	157*
Liveweight gain (kg/day)	0.87	0.94*
Apparent milk conversion ratio	7.36	7.58

*$P < 0.05$. **$P < 0.01$.

It is difficult to compare these MCR figures with others presented in the literature since efficiency of milk conversion is very sensitive to length of lactation, calf liveweight gain and level of cow milk production; however, they are within the range (4.0 to 12.0) given by other sources (Drewry *et al.*, 1959; Bond and Wilkbank, 1970; Neville, 1962).

The regression of calf gain on milk yield was calculated for the pooled data and was:

$y = 0.056\ x + 74.9,\ r = 0.81$ where

y = calf gain from birth to 135 day (kg)

x = 135-day milk yield (l)

Separate regressions were calculated for the two groups of calves but they did not significantly differ from the pooled regression although the F × A group did tend to have a higher intercept value than that of the A calves.

Effect of the Additional Milk Production on the Cows

There was no real difference in the post-calving liveweight gain of the cows. Cows rearing Friesian × Angus calves lost 5 kg more at calving than those with Angus calves but this difference was non-existent at weaning. The only real effect on the cows is of the additional 82 kg SCM yield which at a requirement of 4.80 MJ/kg would represent an increase of 3% in the daily feed requirements of the cow. While this could not be termed a large increase, it does support the management advice that cows suckling crossbred calves be given preference for grazing over cows suckling purebred calves.

CONCLUSIONS

It has been shown that cows suckling Friesian × Angus calves are likely to produce 9.5% more SCM in a lactation of 135 days. Although this difference is not statistically significant, owing to the extremely wide variation in milk production between cows in any one group, it is supported by the additional suckling time and suckling frequency, and slower suckling rate of the Friesian × Angus calves which may stimulate milk secretion and supports earlier work done on sheep (Moore, 1966).

It is not clear, of course, whether the difference in milk production is a result of stimulation of milk production by Friesian × Angus calves, both pre- and post-natally, or sub-optimal milk production of the cows suckling Angus calves owing to incomplete milking which can reduce milk yield by up to 10% (Schmidt *et al.*, 1964). It is unlikely that the Angus calves left sufficient milk (2 to 4 kg) required to cause this reduction.

This increased milk production is equivalent to an increase of 3% in the daily feed requirements of the lactating beef cow.

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