Variations in milkfat test, live weight, colour and height associated with the use of Friesian sires in some New Zealand dairy herds

K. L. MACMILLAN, H. V. HENDERSON AND A. M. BRYANT

Ruakura Animal Research Station
Ministry of Agriculture and Fisheries, Hamilton

ABSTRACT

The average milkfat test for groups of first cross Friesian × Jersey (FJ) cows in 9 Waikato herds was 4.68%, ranging from 4.36% to 5.46%. Animals with 75% Friesian breeding had an average test 0.05% lower than their first cross contemporaries whereas those with 25% Friesian breeding had an average test which was 0.25% higher. Variation in colour and height at withers were not reliable indicators of an FJ animal's test.

Regression analyses with records of sires' progeny-tested by the New Zealand Dairy Board from 1961 to 1979 showed that each 1 unit increase in milkfat breeding index (BI) in Jerseys was associated with an increase of 0.85 units in milk BI. The comparable figure for Friesians was 0.55 milk BI units. Since 1961, the average milkfat BI of Jersey sires selected for further use has increased by 24 units (117 to 141) with an associated increase in milk BI of 14 units (114 to 128). Comparable changes for Friesian sires were 17 units (121 to 138) and 6 units (115 to 121).

The average live weight at calving over 4 seasons at Ruakura for high BI Jerseys was 385 kg compared to 404 kg for 'AB' Friesians. The concurrent increases in milk and milkfat BI's in the Jersey breed may have been associated with a greater increase in live weight than in the Friesian breed. Owners of herds of FJ cows need not expect substantial changes in milkfat test or live weight through the continued use of Friesian sires to produce replacement heifers.

Keywords Friesian × Jersey; milkfat test; live weight; colour; height; breeding index

INTRODUCTION

The increase in the proportion of Friesian and Friesian × Jersey (FJ) cows in the national herd has not resulted in a decline in the average milkfat test (Macmillan, 1982) but may have increased flush milk volumes (Paul and Benseman, 1983). The breed change has occured in spite of recommendations that there was no great advantage in using Friesian semen with Jersey cows (Quartermain and Carter, 1969; Campbell, 1977). Although Friesian or FJ cows may produce more milkfat per cow, the extra production was considered insufficient to compensate for the heavier live weight.

Two recent surveys in herds which comprised Jersey and FJ cows both showed that FJ's consistently out-produced their Jersey herdmates by 17 to 23 kg of milkfat (Macmillan *et al.*, 1981). Size differences related to breed may be diminishing. Bryant and Trigg (1981) found that high breeding index (BI) Jersey cows were about 45 kg heavier at calving than low BI contemporaries. Initial results suggest BI-related live weight differences in Friesians may be less and even reversed (Davey *et al.*, 1983).

This paper reports on differences in the milkfat test of FJ cows, and probable trends associated with the continued use of Friesian sires.

MATERIALS AND METHODS

Two scoring systems were devised for use with FJ cows. The first score estimated the proportion of each cow's flank which was white. A completely white flank was scored 5 and a black flank 1. Variations between these extremes were scored in units of 0.5. The second score estimated height at withers. Again scores ranged in 0.5 units from 1 (a tall Friesian cow) to 5 (a short cow similar in height to a Jersey heifer).

Both scoring systems were applied to 514 FJ cows in 9 Waikato herds each with from 20 to 103 FJ animals. Almost all the FJ cows were progeny of AB Friesian or Jersey sires from AB dams. Lactational average milkfat test figures were used in the regression analyses to estimate relationships between size or colour score and test, taking into account age and genotype (i.e., % Friesian ancestry).

Results from 1689 Jersey and 1076 Friesian sires included in the progeny testing scheme operated by the New Zealand Dairy Board from 1961 to 1979 were analysed to establish the relationship between milk and milkfat BI. Sires subsequently selected for further use in the AB service with reliability coefficients of at least 90% were re-analysed separately.

Comparisons of the live weights at calving of the high BI Jerseys at Ruakura No. 5 Dairy and of the

Friesians at No. 2 Dairy were made over the period from 1980 to 1983. The Friesian animals were derived originally from Jersey dams inseminated with Friesian semen in 1968 (Campbell, 1977). Young stock from both herds were well reared and were not included in experimental herds until 21 months of age.

RESULTS AND DISCUSSION

The average milkfat test for the 9 groups of first cross (F_1) FJ animals was 4.68% (SD = 0.36) ranging from 4.36% to 5.46%. Animals which were 75% Friesian had an average test 0.05% below the average test of their F_1 herdmates whereas those which were 25% Friesian averaged 0.25% higher. The highest producing herds also had higher testing F_1 animals.

Some herd owners maintain an FJ cross-bred herd either by breeding smaller FJ animals to Friesian sires and larger herdmates to Jerseys, or by breeding white coloured animals to Jersey and black herdmates to Friesian. Both systems are stated to produce ideal 'intermediates' for colour, size and test. These beliefs were not supported by the results from regression analyses of milkfat test (adjusted for herd differences) against the scores for height (adjusted for age) and colour. The equation containing both variables was:

$$\%\ \text{milkfat} = 4.28 - \underset{(\pm 0.03)}{0.07} \times \text{colour} + \underset{(\pm 0.04)}{0.14} \times \text{size}\ (R^2 = 0.04)$$

with an increase of 0.85 units in MBI compared to a 0.55 MBI-unit increase in Friesians (Table 1). Among sires which received further use (selected sires, Table 1) the correlated MBI increases were smaller but the breed difference remained.

Time trends among selected sires showed that the average annual increase in FBI was 1.35 units for the Jerseys and 0.91 units for the Friesians (Table 1). Whereas this increase in FBI in Jerseys was associated with an annual increase in MBI of 0.79 units, the Friesians had an annual increase of only 0.30 units. The increase in FBI in the Jersey breed was associated with a significant increase in MBI whereas the FBI increase in the Friesian breed has been achieved by increasing milkfat test more than volume. The estimated FBI increase from 1961 to 1979 of from 117 to 141 in the selected Jersey sires was associated with an MBI increase of from 114 to 128. Comparable changes among the Friesian sires were from 121 to 138 in FBI and from 115 to 121 in MBI.

These genetically related trends in milk volume and milkfat test are supported by results from high BI and low BI comparisons in Jerseys (Bryant and Trigg, 1981) and Friesians (Davey *et al.*, 1983). In Jerseys, milkfat production differences related to FBI were not associated with differences in milkfat test whereas high FBI Friesians produced more milk with a higher test. The increase in milk volume in Jersey cows associated with the continued use of AB Jersey sires may also

TABLE 1 Regression coefficients of milkfat BI on milk BI among Jersey and Friesian sires progeny-tested by the New Zealand Dairy Board and among sires selected for further use, and regression coefficients of annual average milkfat and milk BI since 1960.

Breed group	n	Intercept	Slope	R^2 (%)
All Friesians	1076	58.57[1]	0.55[1]	30.3
Selected Friesians	104	77.19	0.44	24.5
All Jerseys	1689	20.70	0.85	55.3
Selected Jerseys	119	33.99	0.78	48.8
Annual change:				
Friesian milkfat BI	19	120.59[2]	0.91[2]	87.2
Friesian milk BI	19	114.85	0.30	20.5
Jersey milkfat BI	19	115.35	1.35	88.4
Jersey milk BI	19	112.84	0.79	63.7

[1] Milkfat BI = 58.57 + 0.55 × milk BI.
[2] Annual average milkfat BI = 120.59 + 0.91 × years since 1960.

Each cow's milkfat test should be used to select a breed of sire or a sire within a breed if test is an important breeding objective.

Genetically related changes in milkfat yield and test will be influenced by trends within the New Zealand Dairy Board's progeny testing scheme and final selection of sires for use as proven sires. Among bulls progeny tested from 1961 to 1979, milk BI (MBI) was more strongly correlated with milkfat BI (FBI) in Jerseys than in Friesians. A unit increase in FBI (the main criteria for selection) in Jerseys was associated

TABLE 2 Average live weights at calving (kg) for high BI Jerseys (No. 5 Dairy) and 'AB' Friesians (No. 2 Dairy) from 1980 to 1983.

	Friesian		Jersey		
Age	n	Lwt.	n	Lwt.	Difference
2	116	351	75	343	+8
3	108	379	56	358	+21
4	91	410	67	393	+17
>4	267	435	156	411	+24
All ages	582	404	354	385	+19

be associated with increased live-weight at calving (Bryant and Trigg, 1981). It is probable that previously reported weight differences between the 2 breeds will have diminished. This trend is confirmed by results in Table 2. Since 1979, replacement heifers at Ruakura No. 2 Dairy and No. 5 Dairy have received similar management and have not been included in grazing trials. Therefore live-weight comparisons can be made between high BI Jerseys and high BI 'AB' Friesians which should be typical of Friesian-type animals found in many herds which have made continuous use of Friesian semen in an originally Jersey herd. The average live weight at calving for the high BI Jerseys was 385 kg compared with 404 kg for the 'AB' Friesians with a similar average BI (Table 2). This average difference of 19 kg varied from 8 kg (2-yr olds) to 24 kg (mature cows). It is less than half of the average breed-related difference reported by Campbell (1977) and Quartermain and Carter (1969). Comparisons with this latter study show that whereas the average weight for Jerseys may have increased by 42 kg, the change in crossbreds is only 21 kg. More extensive data from commercial herds will be required to confirm the recent Ruakura results.

CONCLUSIONS

The owners of herds largely comprising FJ cows need not expect substantial changes in average milkfat test or live weight through the continued use of progeny tested Friesian sires. This is most likely because increases in FBI in the Friesian breed are associated with increased milkfat test rather than increased volume. In contrast, FBI increases among Jersey sires have been associated with increased MBI and with heavier live weights at calving.

REFERENCES

Bryant A. M.; Trigg T. E. 1981. Progress report on the performance of Jersey cows differing in breeding index. *Proceedings of the New Zealand Society of Animal Production* **41:** 39-43.

Campbell A. G. 1977. Comparative dairy production of Jerseys and Friesian-Jersey crossbreds. *Proceedings of the New Zealand Society of Animal Production* **37:** 25-31.

Davey A. W. F.; Grainger C.; McKenzie D. D. S.; Flux D. S.; Wilson G. F.; Brookes I. M.; Holmes C. W. 1983. Nutritional and physiological studies of differences between Friesian cows of high and low genetic merit. *Proceedings of the New Zealand Society of Animal Production* **43:** 67-70.

Macmillan K. L. 1982. Past and predicted trends in breeds, genetic improvement and breeding management in dairy cattle. *Proceedings of the Ruakura farmers' conference* **34:** 83-90.

Macmillan K. L.; Duganzich D. M.; Bryant A. M. 1981. Production differences between Jersey and Friesian × Jersey cows in commercial dairy herds. *Proceedings of the New Zealand Society of Animal Production* **41:** 48-52.

Paul K. J.; Benseman B. R. 1983. Factors affecting flushmilk production in the Waikato. *New Zealand journal of experimental agriculture* **11:** 127-130.

Quartermain A. R.; Carter A. H. 1969. Weight and productivity of dairy cattle. *Proceedings of the Ruakura farmers' conference* **21:** 165-171.