FEED INTAKE CAPACITY AND REPRODUCTIVE PERFORMANCE IN HOLSTEIN-FRIESIAN COWS DIFFERING GENETICALLY FOR BODY WEIGHT

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This thesis is entirely dedicated to my mother Mercedes. To you, I owe more than words can say. Thank you for your endless love.

ABSTRACT

The work outlined in this study was intended to evaluate some differences between cows from two genetic lines of Holstein-Friesian (HF) cows, which have been selected for either heavy or light live weight, but are of similar high genetic merit for milk production. The two aspects studied in this thesis were, feed intake capacity and their reproductive performance because these characteristics can have important effects on efficiency of the cow, and they may be affected by selection for live weight.

In both 1998 and 1999, 16 and 24 pregnant non-lactating high genetic merit Holstein-Friesian cows, which differed genetically in size and weight, were selected from the high (H) and low (L) breeding value for live weight (LW) herd at DCRU Massey University, with eight and 12 animals for each line in 1998 and 1999 respectively. These were fed to appetite on hay (7.52 MJ ME/kg DM in 1998) and on pasture (11.1 MJ MD/kg DM in 1999) in order to measure the maximum voluntary feed intake capacity. The difference between the strains in DMI per cow per day was highly significant ($P<0.01$) in both years. The heavy cows ate 12.52 kg DM of hay and 13.10 kg DM of pasture in 1998 and 1999 respectively, while the light cows consumed 11.11 kg DM of hay and 11.63 kg DM of pasture in 1998 and 1999 respectively. The regression coefficients generated show that for each 100 kg increase in LW, daily dry matter intake per cow increased by 1.43 and 1.81 respectively in 1998, and 1999, a positive correlation between DMI/cow/day and live weight. Overall least squares means values for DMI/cow/day in 1998 and 1999 were 11.81 and 12.36 which indicates that cows in the first year ate 4.4% less hay DM/cow/day than cows on pasture in the second year. Similarly, the overall least squares means values for DMI/cow/day for H and L cows were 12.81 and 11.37, which indicates that H cows ate 11.2% more DM than L cows. The relation between metabolizable energy intake (MEI)/cow per day and LW was also significant ($P<0.01$) and ($P<0.05$) for both years 1998 and 1999 respectively. Least squares means for MEI by line as a treatment and after adjustment by parity number were 94.5 and 144.7 MJ ME/cow per day for the H cows, and 83.9 and 128.4 MJ ME/cow per day for the L cows, in experiment one and two respectively. Regression analysis of the data after conversion into $\log_{10}$, showed that DMI increased in proportion to $LW^{0.66}$ and $LW^{0.65}$ in 1998 and 1998 respectively. These results indicate that lighter cows are not disadvantaged relative to the heavier cows in their capacity to eat feed in excess of their maintenance requirement, which are generally assumed to increase in proportion to $LW^{0.75}$.

The reproductive performance of Holstein-Friesian cows differing genetically for live weight at Massey University was evaluated for the 1998-1999 period. The aim of the study was to evaluate and compare the reproductive performance of the heavy (H) and light (L) cows two year old, three year & older and all age groups. Differences between genetic lines were evaluated for calving intervals: three week calving rate, calving to first service (CFS), planned start of mating to first service (PSMFS), calving to conception (CC), planned start of mating to conception (PSMC), first service to conception (FSC) and calving interval (CI) and percentage of induced cows. In addition, 21 days submission rate (SR), conception rate to first service (CRFS), percentage of cows treated with CIDRs and empty rate were also evaluated. Light cows showed a more concentrated calving pattern than the H cows, and a higher percentage of L cows calved in the first 3 weeks than H cows (72% and 62% respectively). Cows in the H line had a higher proportion of induced calvings. There were no significant differences between H and L cows in CFS, CC, PSMC, FSC and CI. However, the difference in PSMFS between the strains was significant ($P<0.01$): H cows had shorter intervals than L cows (8 days and 13 days respectively). Submission rate at 21days was significantly higher ($P<0.001$) for H cows than L cows (96% and 85% respectively), and H cows had lower CRFS than L cows (50% and 74% respectively; $P<0.05$). Similarly H cows tended to have a higher proportion of empty rates and CIDRs than the L cows. The combination of lower conception rate at the first insemination and the later calving extended the conception and calving pattern for the H cows and at the same time increased the probability of an induced calving. These results indicate that light cows had higher CRFS, achieved a more concentrated calving pattern and fewer needed to be induced to calve than heavier cows.

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