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RELATIONSHIPS BETWEEN BEHAVIOURAL TRAITS, RESIDUAL FEED INTAKE, AND AVERAGE DAILY GAIN IN GROWING DAIRY HEIFERS FED LUCERNE CUBES

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ABSTRACT

Residual feed intake (RFI) is a measure of an individual's efficiency in utilising feed for maintenance and production during growth or lactation. It can be defined as the difference between the actual and predicted feed intake of that individual. Efficient animals eat less than predicted for their body weight and level of performance, and inefficient animals eat more. The objective of this study was to investigate possible relationships between RFI and behavioural traits, such as feeding behaviour, social dominance, and activity in young dairy heifers.

The intakes and liveweights of 1049 growing dairy heifers (6-8 months of age, 195 ± 25.8 kg liveweight) in five cohorts were measured for 42-49 days to ascertain individual RFI. Animals were housed in an outdoor feeding facility comprising 28 pens, each with eight animals and one feeder per pen, and were fed a dried, cubed lucerne diet. An electronic feed monitoring system measured the intake and feeding behaviour of individuals.

Intake was moderately to strongly correlated with RFI for individual cohorts ($r = 0.54$-0.74; $p < 0.001$), indicating that efficient animals ate less than inefficient animals. Several other feeding behaviour traits were related to RFI, but the relationships were weak ($r = 0.14$-0.26; $p < 0.05$) suggesting that feeding behaviour is not a reliable predictor of RFI in growing dairy heifers. Statistical comparison of the extremes of RFI (104 most and 104 least efficient) showed that the most efficient animals (low-RFI) had similar liveweight and average daily gain to the least efficient (high-RFI) ($p > 0.05$) but ate less (mean ± SED; 6.97 v 8.75 ± 0.10 kg cubes), had fewer meals (6.3 v 8.2 ± 0.61/d), shorter daily feeding duration (2.71 v 2.85 ± 0.07 h), ate longer meals (35.6 v 30.6 ± 1.54 min/meal), and ate more slowly (45.4 v 53.0 ± 1.36 g cubes/min) than the least efficient animals (all $p < 0.05$). These groups also differed in their feeding patterns over 24 h. Video recordings of 32 animals showed that daily activity included (mean ± SEM) 15.4 ± 0.5 h lying, 4.8 ± 0.5 h standing, and 2.9 ± 0.1 h feeding. However, neither social status nor activity were related to RFI in this study ($p > 0.05$).

Feeding behaviour explained only a small proportion of the variation in RFI in dairy heifers. Selecting animals for low RFI (efficient) is unlikely to affect social dominance and activity, although these results should be confirmed in a grazing environment representative of most New Zealand dairy farms.

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Soli Deo Gloria

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LIST OF ABBREVIATIONS

ADG	Average daily liveweight gain
ANOVA	Analysis of variance
BW	Breeding Worth
CSV	Computer separated value
d	Day(s)
DI	Dominance Index
DM	Dry matter
EID	Electronic identification
EV	Economic Value
g	Grams
h	Hour(s)
h^2	Heritability
kg	Kilogram(s)
LWT	Liveweight
Min	Minute(s)
n	Number
RFI	Residual feed intake
SD	Standard deviation
SED	Standard error of the difference
SEM	Standard error of the mean
TMR	Total mixed ration