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**MASSEY
UNIVERSITY**

Phenotypic Relationship between Milk Fatty Acid Profile and Live Weight Change in Early
Lactation in New Zealand Dairy Cattle

A thesis presented in partial fulfilment of the requirements for the degree of

Master of Science

in

Animal Science

Institute of Veterinary, Animal and Biomedical Sciences

Palmerstone North, New Zealand

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2016

ABSTRACT

The phenotypic relationship between milk fatty acid (FA) profile and live weight (LW) change in early lactation in grazing Friesian x Jersey (FxJ) cows was investigated in this study. Data used in this study comprised of 73,040 daily milk yields, 5,936 fortnightly herd-tests for fat, protein and lactose, 41,981 daily live weights, and 882 determinations of FA profiles from 300 second-lactation FxJ crossbred cows recorded during the production season 2003-04. Cows were classified based on the magnitude of LW change from calving to peak lactation into three groups: cows with low live weight loss (L; below -0.012kg), medium live weight loss (M; below -0.174kg and high live weight loss (H; below -0.340kg). LW change was considered as a proxy for energy balance. Correlations between LW change and individual FAs or group of FAs were estimated at the three stages of lactation (early, mid and late). Stage of lactation affected significantly ($P>0.05$) the concentration of all FAs considered in this study, except the concentration of C20:0. Higher concentration of C18:0 and C18:1 cis-9 was observed in early lactation relative to other lactation stages. Compared to the L and M cows, the H cows had higher concentration of C18:1 cis-9 in early lactation. Live weight loss in early lactation was significantly associated with higher concentrations of unsaturated ($r = -0.19$), long-chain FA ($r = -0.17$), C17:0 ($r = -0.14$), C18:1 cis-9 ($r = -0.20$) and C18:3 cis-9, cis-12, cis-15 ($r = -0.21$), but live weight loss was significantly associated with lower concentrations of saturated FA ($r = 0.18$), medium-chain FA ($r = 0.16$), C12:0 ($r = 0.24$), C14:0 ($r = 0.17$) and C15:0 ($r = 0.22$). The association between LW changes in early lactation and most of the FAs were not significant in mid and late lactation. If determination of FA can be implemented using mid-infrared spectroscopy, a conclusion from this study is that concentration C18:1 cis-9 in early lactation can be used as indicator of live weight change (energy balance). Further studies are required to evaluate the inclusion of concentrations of FAs in breeding programs to improve fertility in seasonal grazing dairy cattle.

DEDICATION

I would like to dedicate this thesis to my kids, Abednego and Abigail, and I am grateful to have such wonderful loving kids, to my beloved wife, Beatrice Senyagwa.

ACKNOWLEDGEMENTS

First, I would like to express my sincerest thanks to the Ministry of Foreign Affairs and Trade of New Zealand for the scholarship to study my Master's degree at Massey University. Special thanks to my chief supervisor, Professor Nicolas Lopez-Villalobos, for guiding me throughout my study and thesis writing period. I appreciated all of his suggestions on theoretical and mathematical aspects that enriched this thesis. Nicolas, I thank you very much for your unconditional support and sharing with me ideas from your very clear mind – muchas gracias Nicolas.

I express further thanks to the New Zealand Livestock Improvement Corporation (LIC) for providing the data used for this research. Thanks to my colleagues, postgraduate students (Charlotte Gray, Felipe Lembeye and Robin Harris) and others. Simple acknowledgment can't express my thanks to you all. I wouldn't have finished this thesis without your bright ideas. Special thanks goes to the International Student Office team – Sylvia Hooker, Jamie Hooper, Broderick Dave and among others – for their kindness and support. Thank you to the government of United Republic of Tanzania through the President's office public service management team for allowing me to pursue my study in New Zealand.

Special thanks to my wife, Beatrice John Senyagwa, for her persistent encouragement and motivation during the period of my study. Very special thanks go to my son and daughter, Abednego and Abigail, for their patience when I was not with them.

Last, but not least, acknowledgement goes to my mother, Angeline Mkunda and uncle Ishumalia Mkunda, for raising me in a good way, and I appreciate their love and support throughout my study life. Above all, I thank GOD for bestowing on me good health and the necessary patience for me to complete my study in New Zealand.

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LIST OF ABBREVIATIONS

Δ LW	Live weight change
ALA	α -Linolenic acid
CLA	Conjugated linoleic acid
EB	Energy balance
F	Friesian
FA	Fatty acids
FxJ	Friesian x Jersey
J	Jersey
LA	Linoleic acid
LCFA	Long-chain fatty acids
LW	Live weight
MCFA	Medium-chain fatty acids
MIR	Mid-infrared spectroscopy
MUFA	Monounsaturated fatty acid
NEB	Negative energy balance
PUFA	Polyunsaturated fatty acids
SCFA	Short-chain fatty acids
SFA	Saturated fatty acids
UFA	Unsaturated fatty acids
VA	Vaccenic acid

