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**PREDICTION OF THE *IN VIVO* DIGESTIBLE ENERGY VALUE OF BARLEY
FOR THE GROWING PIG ON THE BASIS OF PHYSICAL AND CHEMICAL
CHARACTERISTICS AND *IN VITRO* DIGESTIBLE ENERGY**

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Master of Agricultural Science at Massey University

JIAI CHEN

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ABSTRACT

The study aimed to develop statistical relationships to allow the prediction of apparent digestible energy in barley based on simple physical and chemical measures. A second aim was to evaluate a recently developed *in vitro* energy digestibility assay.

Seventeen barley samples representing nine varieties were obtained throughout New Zealand during the 1995 harvest. The samples were subjected to chemical analysis and several physical attributes were determined. Ten barley samples were selected on the basis of their crude protein and fibre contents to cover the range in gross chemical composition and digestible energy contents were determined after sampling faecal contents from 30 kg liveweight pigs, given barley as the sole source of energy. *In vitro* dry matter digestibility of the barley samples was determined using a multi-enzyme assay.

The physical characteristics of the barley samples were variable, especially the level of screenings (ranging from 1 to 11.6%) and to a lesser extent the moisture content (ranging from 12 to 16.2%) and 1000 seed weight. The chemical composition of the barley samples differed with the crude protein content ranging from 7.8 to 11.7%. The mean levels of Neutral Detergent Fibre (NDF), Acid Detergent Fibre (ANF) and lignin were 16.4 %, 4.2%, and 1.1%, respectively. Total β -glucan and GI extracted β -glucan contents were also determined with mean values of 4.5% and 1.4%, respectively. The *in vivo* apparent digestibility of energy (DE) ranged from 72.5% to 78.4% with a mean digestibility of 75.8%.

Among the physical and chemical characteristics, only the seeding rate was significantly correlated with *in vivo* energy digestibility ($r = 0.73$, $P < 0.05$). The gross energy (GE) content was significantly correlated with apparent digestible energy content ($r = 0.78$). When the gross energy value of a sample

is known, an approximation of the apparent digestible energy (ADE) content can be made using a simple prediction equation: $\text{ADE MJ/kg dry matter} = -10.48 + 1.33 \text{ GE MJ/kg dry matter}$.

Repeatability of the *in vitro* digestibility of dry matter (DDM) was high ($r = 0.68$) but the correlation coefficient between *in vivo* DE and *in vitro* DDM for the barley samples ($r = 0.29$) was not statistically significant. However, when combined with results for several wheat milling by-products, the *in vitro* DDM was significantly ($p < 0.01$) correlated to the *in vivo* DE ($r = 0.96$) indicating that *in vitro* DDM is a good predictor for *in vivo* DE across feedstuffs but not within a feedstuff.

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TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
GENERAL INTRODUCTION	1

Chapter 1

FEED EVALUATION AND THE NUTRITIVE VALUE OF BARLEY: A REVIEW⁴

1. 1 Introduction	4
1. 2 Feed evaluation in the pig	4
1. 2. 1 The chemical composition of feeds	5
1. 2. 2 The digestibility of nutrients in feeds	6
1. 2. 3 Digestion in the pig	8
1. 2. 3. 1 Morphology of the digestive tract	9
1. 2. 3. 2 Digestive enzymes and nutrient digestion	10
1. 2. 3. 2. 1 Digestion of carbohydrates	11
1. 2. 3. 2. 2 Digestion of protein	14
1. 2. 3. 2. 3 Digestion of fat	17
1. 2. 3. 3 Factors influencing digestibility <i>in vivo</i>	18
1. 2. 4 Evaluation of energy and protein values in feeds	20
1. 2. 4. 1 Energy evaluation	20
1. 2. 4. 1. 1 Energy and energy evaluation <i>in vivo</i>	21
1. 2. 4. 1. 2 Prediction of Energy value by <i>in vitro</i> methods	27

	vii
1. 2. 4. 2 Evaluation of protein	28
1. 2. 4. 2. 1 Faecal versus ileal	28
1. 2. 4. 2. 2 Apparent versus true digestibility	29
1. 2. 4. 2. 3 Cannulation methods	32
1. 2. 4. 2. 4 <i>In vivo</i> versus <i>in vitro</i> methods	33
1. 2. 4. 2. 5 Availability of amino acids	34
1. 3 Nutritive value of barley	37
1. 3. 1 General characteristics of barley	37
1. 3. 2 Chemical composition and nutritive value of barley	39
1. 3. 2. 1 Factors influencing the chemical composition of barley	39
1. 3. 2. 2 Effect of Locality, climate and soil fertility on the chemical composition of barley	40
1. 3. 3 The digestibility and utilisation of nutrients in barley	41
1. 3. 4 Anti-nutritional factors in barley	45
1. 3. 5 Treatments to improve the nutritive value of barley for pigs and poultry	48

Chapter 2

THE CHEMICAL AND PHYSICAL CHARACTERISTICS OF NEW ZEALAND BARLEYS	53
2. 1 INTRODUCTION	53
2. 2 MATERIALS AND METHODS	54
2. 2. 1 Preparation of Barley Samples	54
2. 2. 2 Chemical analysis	54
2. 2. 3 Physical analysis	57
2. 2. 4 Data analysis	57
2. 3 RESULTS	57
2. 4 DISCUSSION	65

Chapter 3

PREDICTION OF THE DIGESTIBLE ENERGY CONTENT OF NEW ZEALAND BARLEYS	68
3. 1 INTRODUCTION	68

	viii
3. 2 MATERIALS AND METHODS	69
3. 2. 1 Determination of Apparent Energy Digestibility <i>in vivo</i>	69
3. 2. 1. 1 Preparation of barley diets	69
3. 2. 1. 2 Animals and Feeding	69
3. 2. 1. 3 Chemical Analysis	70
3. 2. 2 Determination of the <i>in vitro</i> Digestibility of Dry Matter	71
3. 2. 2. 1 In vitro procedure	71
3. 2. 3 Data Analysis	72
3. 3 RESULTS	74
3. 3. 1 The <i>in vivo</i> digestibility of energy in the New Zealand barley samples	74
3. 3. 2 The <i>in vitro</i> digestibility of dry matter in the barley	76
3. 4. DISCUSSION	81
Chapter 4	
GENERAL DISCUSSION	87
REFERENCES	90
APPENDICES	112
Appendix I Liveweights of the pigs and chromium and energy contents of the barley diets and faeces	112
Appendix II Mean of energy digestibility and apparent digestible energy content for the barley samples	114
Appendix III Energy content (as fed basis), digestibility of energy, and dry matter digestibility in pollard and bran samples	114
Appendix iv Variance Analysis for energy digestibility in the barley samples	115
Appendix v Variance analysis of apparent digestible energy content in different barley samples	115
Appendix vi Variance analysis of in vitro dry matter digestibility in seventeen barley samples	115
Appendix vii. The effect of DDM and different feed on the digestibility coefficient of energy	116

LIST OF TABLES

	Page
Table I New Zealand grain and peas, area sown and yield (1993) (Source: New Zealand Official Year-book 1995)	2
Table 2. 1 Variety, location grown and harvest date for the New Zealand barley samples	58
Table 2. 2 Production data for the New Zealand barley samples	60
Table 2. 3 Physical characteristics of the New Zealand barley samples	61
Table 2. 4 Chemical compositions of the New Zealand barley samples	62
Table 2. 5 Correlation coefficients between chemical compositions and physical characteristics for the barley samples	64
Table 3. 1 The mean (\pm SE) digestibility of energy and mean (\pm S E) apparent digestible energy content of the barley samples	75
Table 3. 2 Repeated measurements (mean of duplicates) for <i>in vitro</i> digestibility of dry matter (DDM%)	77
Table 3. 3 Statistical Correlations between physical characteristics, chemical components, <i>in vivo</i> energy digestibility and <i>in vitro</i> dry matter digestibility	78

LIST OF FIGURES

	Page
Figure 1. 1 Energy utilization in pigs. (Adapted from Noblet and Henry, 1991)	22
Figure 3. 1 Relationship between <i>in vivo</i> DEc (%) and <i>in vitro</i> DDM (%) for barley and wheat by-products	84
Figure 3. 2 The correlation between <i>in vivo</i> ADE and predicted ADE for barley and wheat by-products	85

LIST OF ABBREVIATIONS

AA	Amino acid
ADE	Apparent digestible energy
CP	Crude protein
Cr	Chromium
Da	Dalton
DDM	Dry matter digestibility
DE	Digestible energy
DEc	Energy Digestibility coefficient
DM	Dry matter
g	Gram
GE	Gross energy
ha	hectare
hl	hectolitre
IU	International unit
kg	kilogram
LW	Live weight
ME	Metabolizable energy
ml	millilitre
mm	millimetre
Mw	molecular weight
NSP	Non-starch polysaccharide