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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ABSTRACT

The study aimed to develop statistical relationships to allow the prediction of apparent digetible 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: ADE MJ/kg dry matter = -10.48 + 1.33 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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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